A Database Publication

electron user

Vol. 4 No. 9 June 1987 £1

Have fun with maths

Try our Patience – and play Cubit

Battery-backed ram pack and SEDFS reviewed

Explore Lisp

Start of a new series

The Acornsoft Hits
Volumes 1 & 2

These Acornsoft Hits compilation packages are the results of the recently announced venture between Superior Software and Acornsoft. The games have been carefully chosen to offer a balanced selection of the very best of Acornsoft's classic titles . . . at a price that is simply stunning value-for-money.

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Starship Command Command a starship against the attacking aliens in this demanding high-resolution graphics game. Your ship is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

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Meteors Steer your laser-ship through a hail of meteors, smashing them with your laser bolts as they hurtle towards you on all sides. Avoid being hit by missiles from the flying saucers. The hyperspace escape facility is available as a last resort.

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Rocket Raid and Labyrinth are not available for the Acorn Electron.
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The Acornsoft Hits Volume 2 features:
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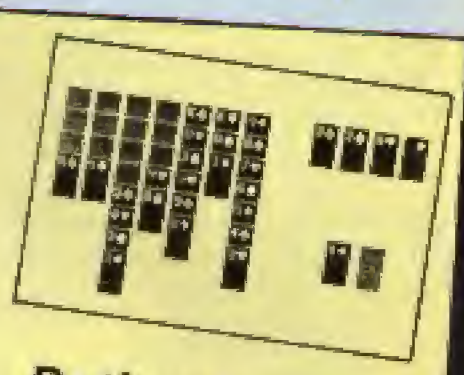

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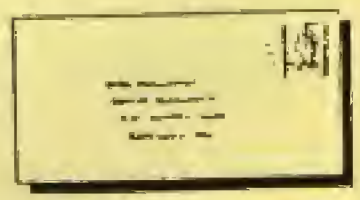

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Oxbridge is an Adventure which takes a light-hearted look at the world of higher education. The cursor keys move you about a beautifully illustrated landscape to meet various brain-teaser type problems. If you like puzzle books, you'll love this game. It is no marathon science-fiction epic taking hours to get into. You make progress within minutes and as you play you absorb the atmosphere and folklore of the world's most famous university.
The author is an Oxford-based mathematician and puzzle composer who has used his skills to pack an incredible 300* pictures into the BBC's memory.
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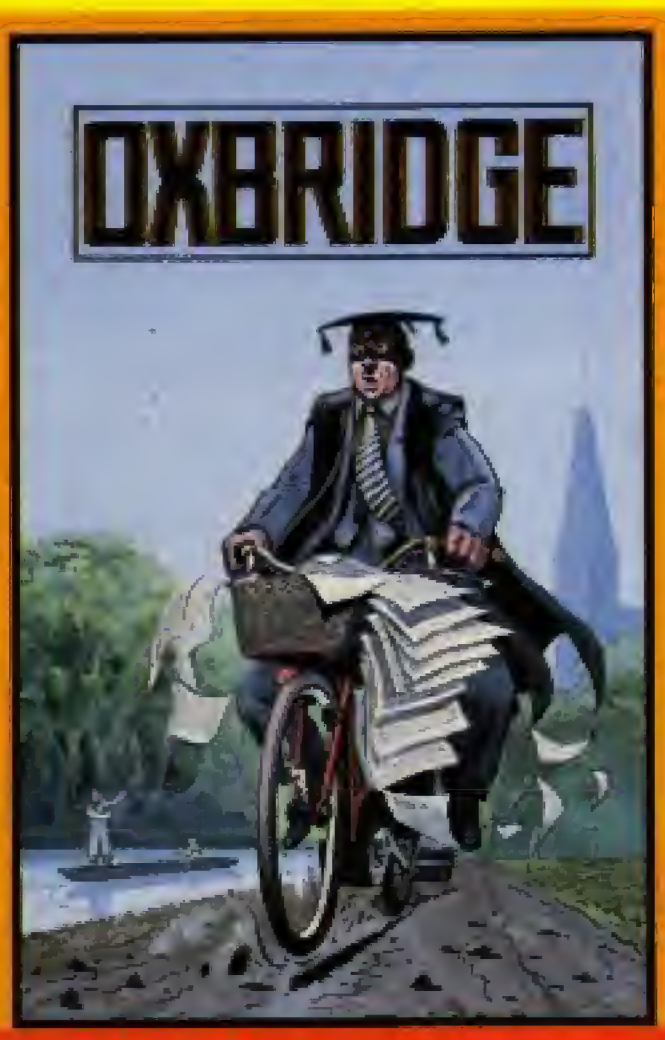

PHANTOM

Something strange has been happening, something unnatural. At first no one took much notice, those who'd experienced it were considered crackpots by those who hadn't. But now people are noticing, the so called 'crackpots' now outnumber the disbelievers.
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electron user NEWS

More sophisticated products for Electron

FEATURES usually found on far more sophisticated machines are now being made available to Electron users.

In yet another big vote of confidence in the little favourite more and more new, serious products have been put on the market recently.

Advanced Computer Products launched the Advanced Control Panel at the May Electron & BBC Micro User Show in London.

Described by ACP boss John Huddlestone as "a significant piece of software", the 16k rom allows the user to produce a customised and nested menu system.

You can access files, load favourite programs, prepare the computer for a specific use, and generally make the machine much friendlier to use. In effect it brings some of the facilities of the Master to the Electron.

Huddlestone said it had taken six months to develop the product, which was compatible throughout the Acorn range.

"It is not just another crazy thing, it is a major product. It does what Gem and the rest do for the bigger machines", he said.

"Using pull-down menus it gets the machine to do what you want it to do without being a professional programmer". Price is £34.50.

Sideways ram is being presented in a more sophisticated manner, too. Two new products have been introduced recently.

Slogger's 32k Sideways Ram is designed for use with the Rombox Plus or the Plus 1 and comes in the form of a cartridge.

The 32k occupies both 16k pages in one cartridge port and when used with another new Slogger product, the Electron Expansion 2.0, it can be used to hold rom images and/or a 16k printer buffer.

The cartridge has full write protect, so preventing corruption of the software contained. Price £34.50.

ACP has produced the Advanced Battery Backed Ram. It has 32k split into 16k blocks and comes with software, which enables you to use it as a printer buffer and load, save and create your own roms. Price £39.95. *(See review on Page 37.)*

The Electron Expansion 2.0 fits into an internal rom socket. It overcomes Plus 1 loading errors and supports all standard functions.

It includes commands for using the sideways ram as a printer buffer and romsave/load commands to produce images for sideways ram. It costs £11.95 on its own or £5 with the 32k Sideways Ram.

Both companies report continued high sales of peripherals, Plus 1 – which Huddlestone says is being sold about as fast as it can be made – and Rombox Plus.

More sophistication for the Electron comes with a device from Project Expansions.

The firm has just produced an upgraded version of its user port which allows the Electron to work with Watford Electronics' Video Digitiser.

The new port's 20-way conector is accessed from the top of the cartridge, to help disc drive owners use it more easily. Also a rom socket has been included for any standard 8k or 16k rom or eprom to be inserted.

Costing £29.95, the port needs a turbo board and disc drive, and a printer is desirable.

Watford's Video Digitiser allows images to be captured through any standard video socket.

Once a picture is displayed it can be treated as a normal graphics screen, allowing you to use any standard graphics command to manipulate it, either from Basic or another sideways ram.

New turn in games

AN Electron motorbike race game that turns corners – two firsts for the machine – is nearing completion.

Described by its programmer as a fun game rather than a simulation, it has the working title of Crazee Rider.

Superior Software is expecting great things from the game when it is released in the summer. Author Kevin Edwards – pictured left – said the main difficulty in producing corners for the Electron was the machine's speed.

There are a series of tracks and to qualify to race in the next one you have to finish in the first six.

You can bump the computer controlled bikes off the road – but they can do the same to you.

Electron keeps the darts peace

THERE are never any arguments about scoring when it comes to darts matches at the Queen's in Birmingham these days.

For the pub team has dispensed with the traditional blackboard and chalk in favour of an Electron.

Now Peter Black, the official scorer, simply types in the results and the program automatically displays on the monitor what is still required.

"I decided to use my Electron after some rather nasty rows involving players from visiting teams", says Peter, a butcher. "On two occasions we nearly came to blows when someone disagreed with my subtraction.

"So rather than risk getting thumped by some argumentative drunk, I brought in the Electron".

And it has worked. For so far no one has seen fit to challenge the computerised figures.

"People seem so impressed to see the numbers flash up on the screen that they have implicit faith in them", says Peter.

"But strangely enough on the first couple of occasions I used it I made more mistakes – through hitting the wrong keys – than I ever did when I used to do the scoring in my head".

However the Electron hasn't done away with darts tradition altogether in the Queen's.

For Peter Black still calls out the numbers before programming them into the micro.

"It wouldn't be the same unless they could hear me saying 'One hundred and eighty'," he told Electron User.

Derek Meakin and 149 fellow diggers attack the green field site of the new headquarters

The big Database dig

THE world's first mass sod-cutting ceremony heralded the start of building a new £1 million home for Electron User and its sister Database Publications magazines.

All of the 150 Database employees took part in the traditional act of ground-breaking to celebrate their role in the company's rise to prominence in computer magazine publishing.

The new site in the Cheshire countryside near Stockport echoed to the sound of scores of spades and shovels hitting the ground simultaneously at a signal from Database head Derek Meakin.

"We originally toyed with the idea of inviting a leading figure in the computer industry to perform the ceremony", he said, "but decided instead to keep it within the company.

Digitised impression of the Electron User's *new home*

"All our employees have contributed to Database becoming the UK's leading publisher of computer magazines – so they all deserved to play a part on the big day".

LIT-UP JOYSTICK

A NEW joystick for the Electron has been launched by Voltmace.

A special feature of the Delta 3S is a set of lights which allows the user to know exactly how far the joystick must be moved in any direction to operate.

Rotary slides – initially greeted with scepticism – have proved most reliable, says the company. They have been included in the new product and have the advantage of eliminating feedback from the switches. Price £19.95.

Manager moves over

ONE of the first results of Prism's take over of the Addictive Games label is the release on the Electron of the best selling soccer computer game ever, Football Manager – at £2.99.

"This means", says Prism "that the game, in its new packaging, will be competing in a new division against the budget software teams.

Prism (01-804 8100) is planning to re-launch Addictive's Silicon Joy label to carry more budget-priced games.

Magus for Electron

WHEN Robico revamps and re-releases the old Magus adventure, Village of Lost Souls, it will ensure that Electron users are not left out in the cold this time.

The original was never released on the machine but Robico plans to rectify that once work is completed on improving the game. This will involve restyling it to fit in with the current Robico range using the company's advanced parser.

Due out in the summer, it will be retitled Realm of Chaos – Village of Lost Souls.

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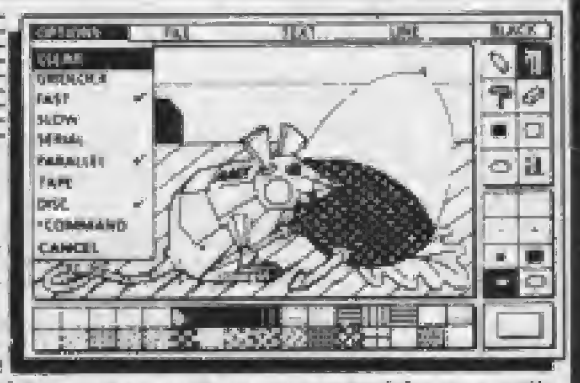

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ICON DESIGNER is an invaluable program for creating and storing icons for use in your OWN programs.

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Advanced Computer Products

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Top 20 surprise – geezers dodge in at No.3

IT'S Top Twenty time again, and this month the chart makes very interesting reading.

Although few people will be shocked to see Myorem occupy the top spot and Woodbury End holding on to second place, it is surprising to see Dodgy Geezers enter the chart at number three.

This adventure seems to have tickled a lot of people, but it looks like being Lever and Jones' last text adventure for some time to come, as the dynamic duo are currently flaunting their writing talents in other fields.

Out of the chart since last time have gone Twin Orbs of Aalinor, Incredible Hulk, Savage Island 1, Dracula Island and Sadim Castle to be replaced by Dodgy Geezers, Castle of Riddles, Wychwood, Mystery Fun House and Operation Safras.

The next chart is due in the October *Electron User*, and it will be fascinating to see the effect upon the pecking order of recent releases such as Blazing Star and The Lost Crystal.

Some time ago I asked for readers' responses to an idea concerning a competition for home-penned adventures. The positive mail on this suggestion has been phenomenal. So, a competition there will be!

If readers wish to send me, either on cassette or 5.25in disc, any adventure they have written, I will evaluate it. It can be in either Basic or machine code or produced with the aid of one of the adventure-writing aids such as The Quill from Gilsoft.

How you write it is up to you, all I am interested in is the quality of the finished product. A listing and/or full solution would be much appreciated too.

The address to send them to is: Adventure Contest, Electron User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

The closing date for entries to this is July 31 1987. The winner's adventure will be included on the *Electron User* monthly tape and will receive a bundle of five top class text adventures of his or her choice.

I am afraid I am unable to return any entries, so send a copy, not your original game.

I must find room to comment briefly on Epic's The Lost Crystal. If you haven't yet got a copy, you must have been on the moon for the past two months.

I am having immense fun tackling this adventure and have so far discovered about 100 of the 400 plus

READERS' TOP TWENTY

1	Myorem	Robico	96
2	Woodbury End	Shards	91
3	Dodgy Geezers	Melbourne House	90
4	Rick Hanson	Robico	89
5	Operation Safras	Shards	88
6	Wheel of Fortune	Epic	87
7	Castle of Riddles	Acornsoft	86
8	Philosopher's Quest	Acornsoft	85
9	Project Thesius	Robico	84
10	The Ferryman Awaits	Kansas City	83
11	Sphinx Adventure	Acornsoft	82
12	Twin Kingdom Valley	Bug-Byte	80
13	Castle Frankenstein	Epic	78
14	Rebel Planet	Adventure Soft UK	76
15	Terrormolinos	Melbourne House	75
16	Classic Adventure	Melbourne House	74
17	Wychwood	Larsoft	73
18	Mystery Fun House	Adventure Soft UK	68
19	Hampstead	Melbourne House	67
20	Countdown to Doom	Acornsoft	64

PROBLEMS SOLVED

After some months respite, it appears that Sphinx Adventure has reared its head again with a multitude of problems.

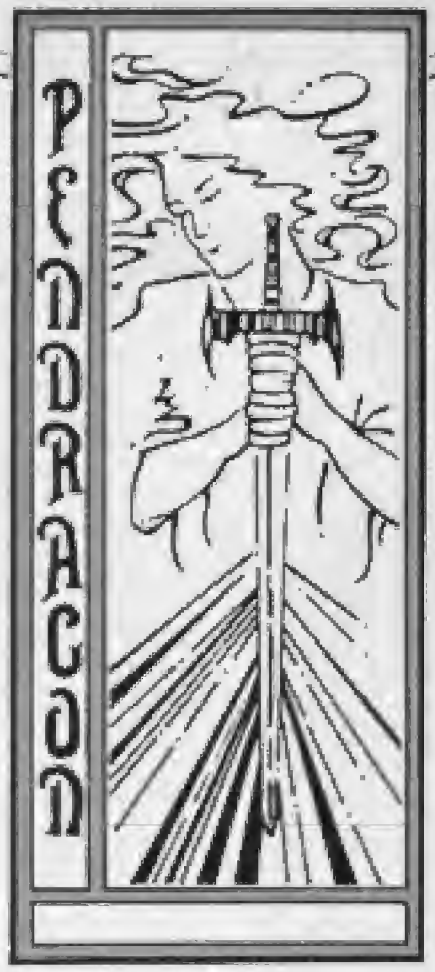
Jackie Billings asks where she can find the mouse. If you make your way back to the troll's bridge and from there go to the bear's cave you are on the right track.

You must then enter the iron passages and find Castle Hill. The mouse will then be discovered scurrying around the dungeons of the castle.

Anthony Craven wants to know the purpose of the Mithril ring. It has magical properties and should be rubbed.

Anthony and Daniel Gilbert need to find the pirate's hideout. You should cross the glacier and then explore the catacombs.

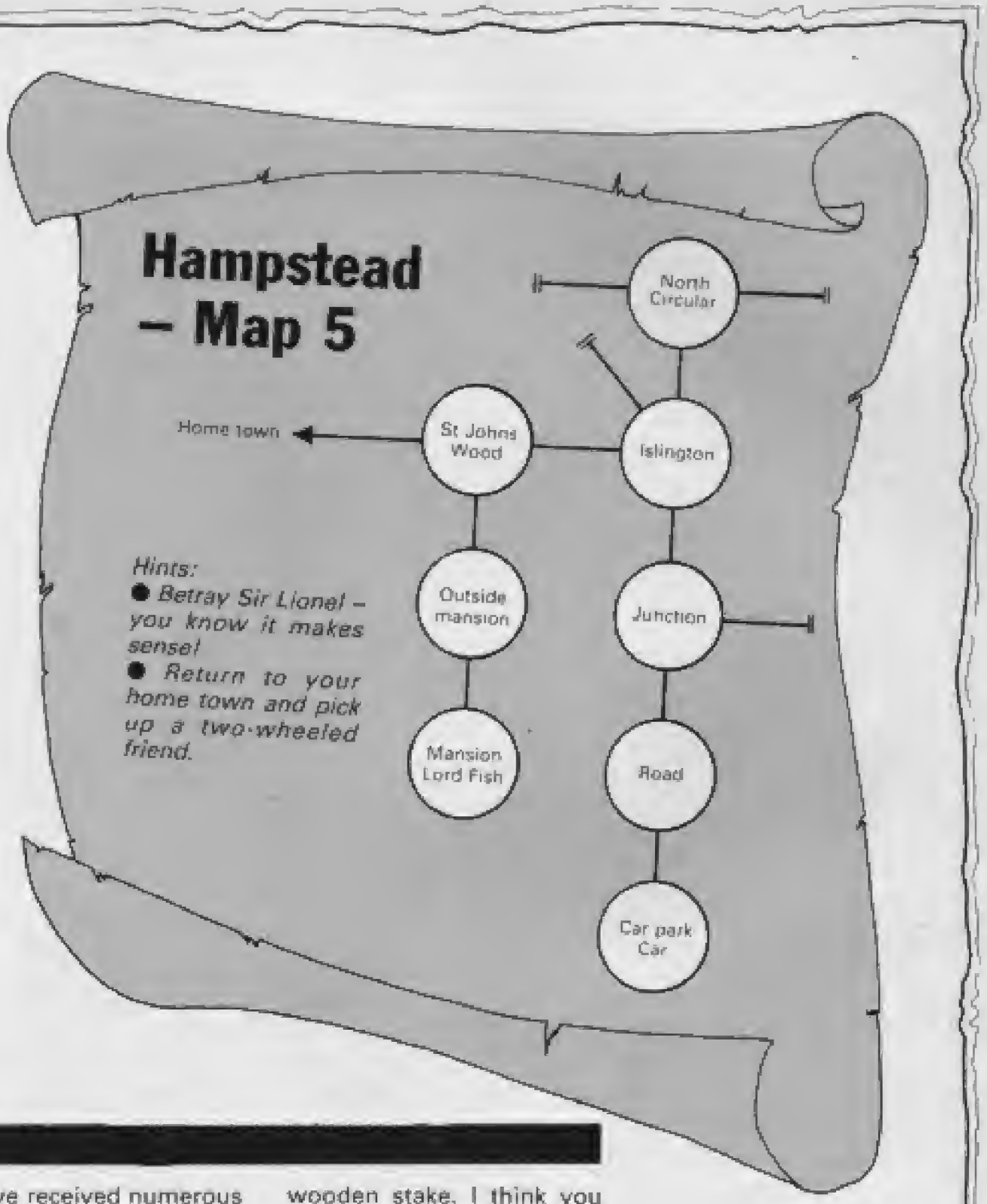
Georgia Corrick has been stuck with Sphinx for over a year now and doesn't seem to be able to progress further than the fiery passage.



locations. I still keep thinking about that poor miller!

Another adventure which should be drawn to your attention is the Electron Adventure Club's Magnetic Moon. In three parts, it is a bargain at £4.95, or free to club members.

Finally, watch out next month for a special on that superb adventure, Myorem.



You need to collect water in the bottle and throw the water at the walls of flame. Also if you map your progress, you can avoid the pirate altogether.

Andrew Myers tells me that there is no need to cross the lake in Sphinx Adventure. The only reward for doing so is to obtain the crown, but you lose the boat, which is worth 30 points. Hence you can finish the game more quickly and with almost maximum points.

Can anyone beat 279 moves?

While on the subject of Sphinx, I must thank Mr R. Gudgeon for a super extension of Simon Doyle's listing for the function keys. Mr Gudgeon has successfully programmed the first 30 moves of the adventure on one key.

Anybody who would like a copy of this listing should send me a stamped addressed envelope.

I have received numerous requests for help with Adventure Soft's Kayleth. Colin Campbell wants to know how to escape from the conveyor belt. You must bend the bars and go up, Colin.

Emma Rutherford and partners are experiencing difficulty in getting the Yagmok to speak. He doesn't like androids with coloured eyes, so a bit of thinking is required.

Meanwhile, Sir Galahad asks why he can't see with the lenses. I think that you should only use them in bright light, my Lord.

TKV has its fair share of problems this month. Alexis Adamou of Cyprus writes to say that he can't find the bag. Which bag are you referring to Alexis, as there are five different ones?

Perhaps you should look in the mountains for the first one.

Ben, who's only 10, asks where he can find the wooden stake. I think you mean the wooden staff, and that will be discovered in the west turret of the castle.

Edward Duncan has found the secret of life, but can't proceed any further. Without giving you a full solution, I suggest that you make a detailed map of your travels and read the advice offered in previous editions of this column.

Finally, in order to whet your appetites for next month, here are a couple of hints to help the multitude of people who are stuck at the beginning of Myorem.

You have no option but to THINK if you wish to escape the firing squad. Your means of escape from the ditch must lie in careful manipulation of the objects you find in order to build something which will float. I promise to be more specific next month.

Adventure database

Included on this month's Electron User *cassette is a massive database containing all the adventures available for the Electron. Also included are adventures for the BBC Micro that run on the Electron. You'll find the name and address of each software company, a list of the adventures they produce and whether they are available on tape or disc. This is stored as a View text file and can be loaded into View using READ. You can then print it out or save it to disc.*

This is an absolute must for all adventurers!

From Page 11

HALL OF FAME

***Arrow of Death 1 – John Tipper** (continued)*

Return to the courtyard, get the amulet from the messenger, go to the forest and WAIT. Go to the ferry, GIVE AMULET then after the ferryman has taken you aboard, WAIT. Find the slave and CUT CHAINS, go to the boulder and move it.

Now go to the circle of toadstools and GET TOADSTOOL. Go to the Cookhouse and DRUG BROTH. Wait a couple of moves then GO BUILDING, GO LADDER, TAKE LOG, GO WEST and GO FLUME.

When you are in the sea, WAIT and you will see a beach. GO BEACH and find the eagle, then PLUCK EAGLE. Go to the dwarf's hut, examine the dwarf then examine his hut. Take his specs, GO NORTH to the village, examine the debris, go down through the trapdoor and open the chest.

Use the specs to read the book then go back to the hut and GET MEDALLION. Proceed to the marsh, enter and go to the sacred willow location. Throw the medallion to get rid of the guardians. Finally CUT BRANCH and you will have finished Part 1 of this adventure.

***Enthar Seven – The Boss** (continued)*

You are now in the Command Centre and a thorough exploration of your surroundings is vital to further progress in this adventure. You will discover some objects and locations whose purpose does not become evident until much later in the adventure. Making a map of the Command Centre is also an important step to take.

In the meantime this should enable you to solve some of the more immediate problems: SWITCH ON TORCH – WEST – CLIMB UP SHELVES – TAKE POWER CELL – DOWN – TAKE VACUUM CLEANER – EAST – SOUTH EAST – SOUTH EAST – EAST – SOUTH – OPEN DOOR – SOUTH – TAKE PLASTER – TAKE GLOVES – NORTH – NORTH – EAST – SIT DOWN – TAKE CUSHION – EXAM CUSHION – TAKE NOTE – EXAM NOTE – READ WRITING – STAND – EAST – TAKE PICTURE – DROP PICTURE – EXAM MICROPHONE – WEST – WEST – WEST – NORTH WEST – NORTH WEST – EAST – EXAM VACUUM CLEANER – REMOVE DUST BAG FROM VACUUM CLEANER – EXAM DUST BAG – STICK PLASTER ON DUST BAG – ATTACH DUST BAG TO VACUUM CLEANER – INSERT POWER CELL INTO VACUUM CLEANER – NORTH – DOWN – CLEAN DUST WITH VACUUM CLEANER – OPEN TRAP DOOR – DOWN – PULL LEVER – UP – UP – SOUTH – WEST – WEST – DROP VACUUM CLEANER – SEARCH STORE – TAKE SPANNER – EAST – NORTH – NORTH – SOUTH – SOUTH – SOUTH – PRESS S1.

You are now about to enter Sector 1 on the Planet of Enthar Seven.

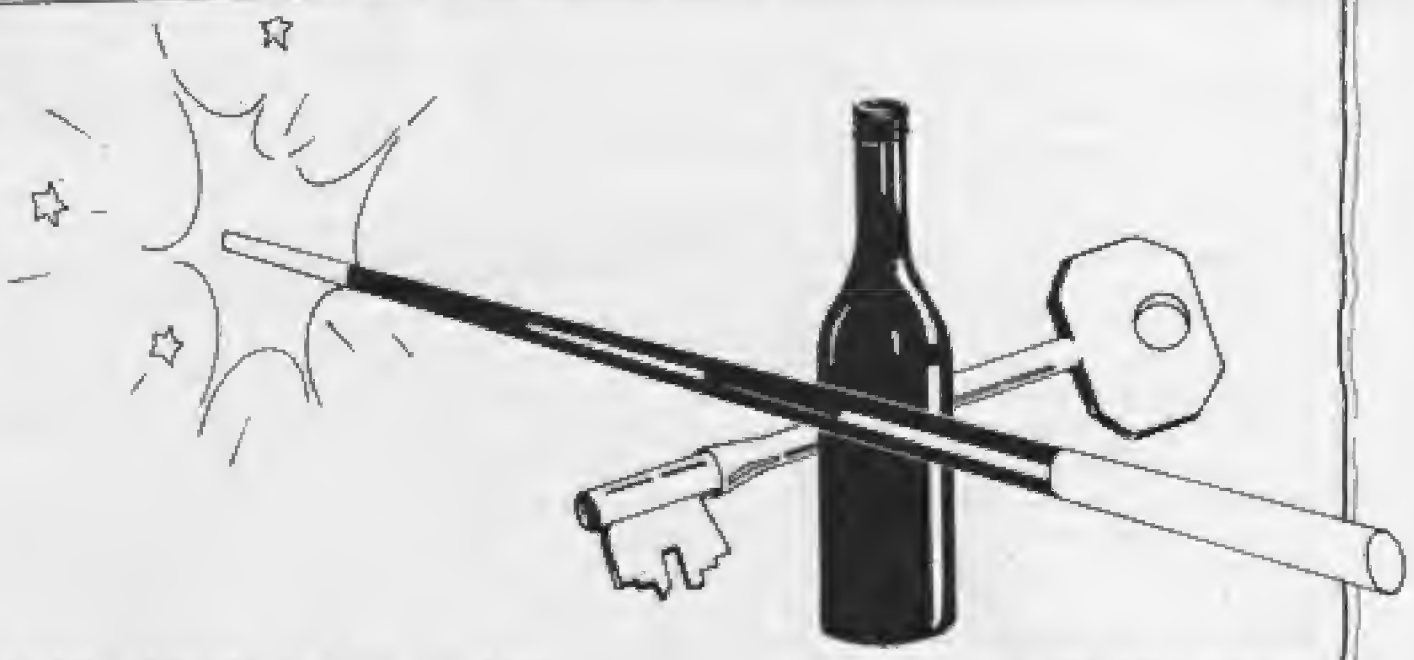
***The Time Machine – Chris Lowe** (continued)*

The four locations you can arrive at are: *The Cellar* – this is where the machine starts off. *The Sphinx* – to enter the Sphinx, push the projecting stone. To get out, jam the lever with a rock and leave by the door to the north. Climb the statue and you will find the prism. You can either kill the dog with a spear or feed him salt beef.

The Prehistoric Age – to move the brontosaurus feed it sea biscuits. To repair the boat, use the torn sail, needle and thread and the rope. Dig with the shovel on the island to unearth the prism.

The Mary Celeste – the prism can be found by climbing the brig.

Various items which are used in other puzzles are scattered around here. Unlock the door with the key and use the crowbar to open the chest.



OVERTURE AND BEGINNERS

The vast majority of text adventures have a large element of magical or non-logical actions within them.

Some of the more naive adventure writers seem to think that we enjoy hammering at the keys for hours and hours before hitting upon some obscure magical word or action.

What usually happens in my case is that I give up long before then and play a better class of game.

Don't get me wrong, some of the best adventures around have elements of magic or the unexpected within them, but notice that they also give the player enough hints or clues to help sort out the incantations or whatever.

Sphinx Adventure is a good example of an excellent and immensely popular adventure which has a fair splattering of magic.

Early in the game you are faced with a gaping chasm which has to be crossed, and only a few possessions at hand. Do you THROW BOTTLE or DROP KEYS? Of course not, that would hold no logic.

You ought to be carrying a wand, and surely WAVE WAND might have some effect at a time like this. Lo and behold a bridge now spans the chasm.

The next magical problem is more devious and involves a safe set in the ceiling. A quick exploration of neighbouring rooms unfolds a word, DIAXOS, which must be magical. You could try rubbing the mithril ring, but saying DIAXOS might have a more desired effect.

You see, Paul Fellows only gives you one magical problem at a time to cope with, and the solution is always close at hand.

● *That's all for now. Next month you'll be amazed at my maze solutions!*

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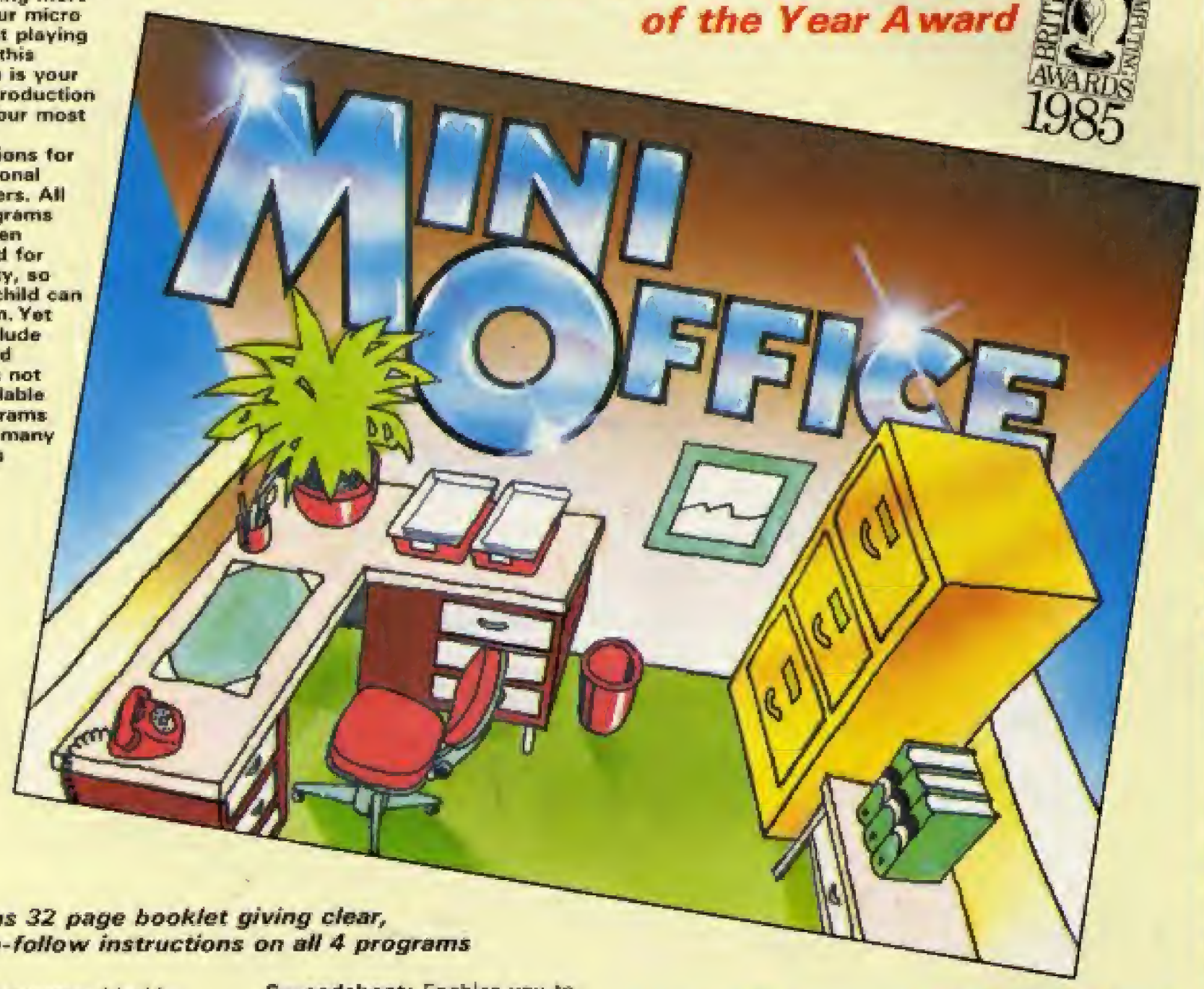

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TO ORDER TURN TO THE FORM ON PAGE 53

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Budget shoot-em-up

Program: Uranians
Price: £2.99
Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB.
Tel: 01-439 0666

LAST month found me loudly singing the praises of Bug-Byte after I had seen Plan B, a fabulous game that has joined my personal all-time favourites.

This month sees another release, Uranians, and this is right at the other end of the scale. One feature I find annoying is that for part of the loading time the counter is not displayed on screen, so you can only hope that loading is taking place.

The title screen graphics are comparable with those seen in a magazine listing, but this could have been forgiven if the quality of the game had made up for it. Unfortunately, after waiting nearly six minutes while the game loads, its arrival is hardly anything to cause celebration.

You have a laser base which moves horizontally across the bottom of the screen, while the alien mothership disgorges her attack ships as she moves across the top.

The first wave of aliens weaves slowly from left to right, and although later waves become a little more belligerent I hardly think that Earth has anything to fear.

Variety is provided by the mothership periodically dropping a firebomb which either engulfs you in a wall of flame – the best graphic effect in the game – or if you manage to avoid it, remains on screen to restrict your movement for a few seconds.

It is a sad reflection on any game when the most enjoyable part is when you get crisped. Uranians is a cross between Space Invaders and Galaxians, but does not have the polish of either. Nowadays we tend to expect better, even from budget games.

Sorry Bug-Byte, after Plan B this is going from the sublime to the ridiculous. The only point I found in its favour was if you have a Plus 1 and Plus 3 fitted it's not necessary to disable them to load the game.

Beejay

Sound	4
Graphics	3
Playability	3
Value	5
Overall	4

Challenging dungeon

Program: Hunkidory
Price: £2.99
Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB.
Tel: 01-439 0666

DAVE the Dungroid is trapped in the dungeons of the planet Hunkidory. All you have to do is help him battle his way through 20 different levels to get back to the planet's surface.

This is an early program by the prolific ladders and levels game writer Peter Scott. Unlike Last of the Free, each level consists of a single screen – you do not wander backwards and forwards from screen to screen collecting objects.

Before you can proceed to the next level you have to collect all 10 valves that are scattered about the screen. As is usual with this type of game, your success depends on your spotting the correct route through the screen, as well as split-second timing.

Each screen is constructed from a mixture of walkways, moving platforms and sharp spikes. Whizzing between these structural hazards are numerous alien life forms. Needless to say, contact with such creatures is always fatal.

The graphics are dated, the sprites very simple, and the backgrounds crude and boring. The screens may be a challenge to complete, but they don't have the necessary gloss to make you want to keep trying till you succeed.

One of the most infuriating features of the game is the way that everything is reset when you lose a life. No matter how close you are to completing the screen, back you go to the starting point and all the valves are replaced.

Controls are simple – left, right and jump. Stepping from the edge of the platform causes you to drop vertically, although the left and right keys can provide a controlled sideways drift.

The instructions contain a mysterious message about pressing Control + C to produce strange effects. On one occasion I tried this combination and exterminated the next alien I encountered. When attempting to reproduce this effect I hung the machine. C'est la vie.

The top two lines of the screen are reserved for a status display. They show the level number, lives left, time remaining before your present droid expires and your score. The program has options that let you play with or without music, or run a demo routine which gives you a second glimpse at every screen you will encounter.

Hunkidory is a very average ladders game – you have been warned.

Steve Brook

Sound	7
Graphics	6
Playability	7
Value for Money	7
Overall	7

Super dungeon

Program: Dunjunz
Price: £2.99
Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB.
Tel: 01-439 0666

MACKSCRANE, the Great Demon, has stolen the Chalice of Binding and hidden it deep within the Dunjunz. Four fearless adventurers must risk their lives to save the chalice and the world.

This is the arcade/adventure game to top them all. It is based around a dungeons and dragons type scenario in which up to four players compete simultaneously. This is achieved by dividing the screen into four action windows, all looking into the same dungeon and each showing the progress of one particular adventurer.

This system enables groups of players to explore the dungeon as a fighting unit, protecting each other against attack by the guards, increasing their firepower when destroying objects, or even killing each other.

The adventurers come in four guises: The Ranger uses a magic bow, the Wizard is hot stuff with a fireball, the Barbarian is an axe-wielding maniac and the Warrior is a mean swordswoman. The weapons all have different attack values – the higher the value the greater the damage inflicted with each blow.

This value is increased if the adventurer locates the magic sword or a pile of weapons. Similarly each character's armour has different values: The Warrior's chain mail and shield offer great protection from most blows, but not so the Ranger's robe which is of little defence against the guards' attack.

A game such as this would not be complete without a smattering of magic, so both the Wizard and the Ranger are endowed with mystical powers. These manifest themselves in smart bomb fashion, destroying every guard on the screen when a certain key is pressed.

The Wizard expends a great deal of energy in casting such a spell, while the Ranger's energy value remains mysteriously unaffected.

As well as the obligatory treasure chests, the dungeon is littered with magical objects and keys. Keys will open doors to new areas of the dungeon, and eating food boosts your energy rating by 10 points, up to a maximum of 99.

Not all objects you discover are beneficial. For example, the dungeon is riddled with trapdoors from which new guards appear to replace their dead comrades.

Most dangerous of all are the energy drainers, innocent-looking squares which relieve you of 20 energy points when touched and are sometimes used to bar your way to a new section of dungeon.

Drainers can be destroyed by multiple blows from a weapon but great care must be taken as they have a defence mechanism which reflects a weapon back on the attacker.

When I first played the game I was under the impression that I had to collect all the treasure on a level before I could jump through the trapdoor to level two. This is not so: If you want, you and your three comrades can exit level one in under 30 seconds. However, in doing so you would pass up the opportunity of improving weapon and armour ratings.

Dunjunz comes with 25 different levels, each loaded individually from tape as required. This may sound tedious, but each level takes only five seconds to load.

Loading occurs automatically when all surviving characters have jumped through the exit trapdoor. It is only necessary for one adventurer to survive to progress to the next level.

Once loaded, all dead characters are reincarnated with a full bill of health but with only the default values for weapons and armour. A surviving character is restored to full strength.

A save game option would have been appreciated, as you are unlikely to fight your way through all 25 levels in a single session.

Ignoring the problem of cramming four people into an area of three square feet, there is no denying that Dunjunz is a stunning piece of programming. The action is smooth and fast, and the levels tortuously difficult. This game will sell and sell.

James Riddell

Sound	6
Graphics	8
Playability	9
Value for money	9
Overall	8

Sinister adventure

Program: Wychwood
Price: £3.95 (mail order only)
Supplier: Larsoft, 4 Chantry Road, Clifton, Bristol BS8 2QD.

WHEN this adventure landed on my desk for review I was absolutely knocked out by the package's sinister graphics. I carefully read the well-written informative notes and loaded the program with anticipation. After only 20 minutes of exploration and head scratching, I was hooked.

You play the role of an ex-convict who shared a cell with a character called Jonesey. He talked in his sleep and gave you a good idea of where he hid the loot from a bank robbery.

Obviously your task is to recover the swag, stashed away near Wychwood Manor, for yourself.

As you leave your car in a quiet country lane which leads east, "the sound of birds fills the crisp air of an early autumn morning". This introductory location gives an indication of the atmospherics of the whole adventure.

You are free to move through the first few locations without encountering any real obstacles, though the pond may at first baffle you.

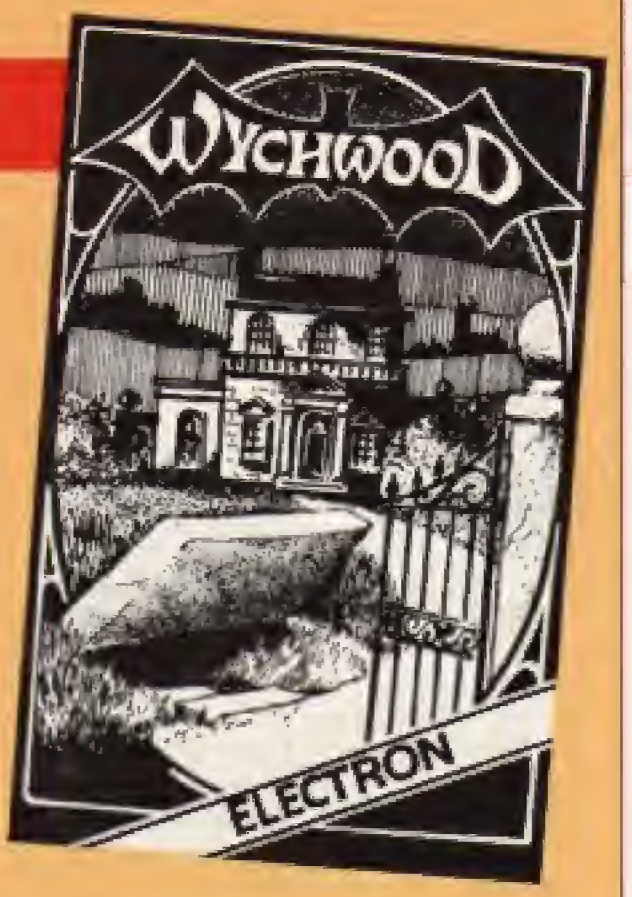
I was particularly taken by the various doors which require different techniques to open them. I expect you'll open the cabin door easily but the front door is rather more difficult – the trick involves a loose key, a paper clip and a newspaper. Try and work that one out! I'll also leave you to discover the secret passage for yourself.

Wychwood isn't a particularly large adventure, but each location will provide interest and material to solve the various puzzles. Try listening to the sermon in church – the reward is quite earthly.

The adventure is littered with objects which require careful examination, thought and manipulation. For instance, in the cabin I discovered a mannequin and clapperboard which had me foxed for hours.

Larsoft boasts that its games are free of bugs, non-violent, and can be solved by pure logic.

If this is an indication of things to come I will have no hesitation in buying all of their future releases.



Pendragon

Presentation	8
Atmosphere	8
Frustration factor	8
Value for money	10
Overall	8

Not such good news

Program: Paperboy
Price: £9.95
Supplier: Elite Systems, Anchor House, Anchor Road, Aldridge, Walsall WS9 8PW.
Tel: 0922 55852

PAPERBOY is a conversion of the arcade game of the same name. In your new job as local paperboy you must deliver your wares to all the regular customers, while at the same time creating as much damage as possible to the homes of non-customers.

The title screen – a highly detailed front page of a newspaper, embellished with several different typefaces – promises a graphical feast.

Press the spacebar to begin the game and you are faced with a two-colour, high-resolution stick man. Not only that, he flickers as he cycles up the street.

The game controls consist of left/right, accelerate/brake, turbo speed and throw. As play begins you are pedalling at full speed, which isn't particularly breathtaking. The only way to go faster is to press both the accelerate and turbo keys. After a short delay you will experience a startling increase in speed – and flicker!

The delay may be due to turbo lag, but whatever the cause, it is responsible for many a tumble.

You begin your new job on the Monday. Cycling up the street you must throw a newspaper into mailboxes positioned outside some of the houses. Those without mailboxes are fair game for vandalism, so smash as many windows as possible while cycling past.

Each dirty deed is totted up as a bonus score and awarded at the end of the round. Be careful not to damage a customer's property or you'll lose every bonus point you have accrued.

So keen is your employer to improve your cycling skills he has constructed a BMX park, so at the end of each day's work you go to the park and race against the clock for bonus points.

Life is not as simple as at first appears, because footpaths and roads are alive with obstacles. You can easily come to grief by hitting dogs, balls, workmen, radio-controlled cars, drunks and Sinclair C5s.

One annoying feature about losing a life is the fact that you are returned to the screen in turbo mode and the brakes don't work. It is not unusual to hit a second object before you have regained control of the bike.

If you feel that you need to have a copy be my guest, but please ask to see a demo before you part with your cash.

Steve Brook

Sound	5
Graphics	6
Playability	5
Value for money	5
Overall	5

```
 10 REM Flashers
 20 REM By John Whigham
 30 REM (c) Electron User
 40 MODE2
 50 FOR pass=0 TO 2 STEP 2
 60 P%=&900
 70 [OPT pass
 80 .Flash
 90 LDA #prog% MOD256
100 STA &220
110 LDA #prog% DIV256
120 STA &221
130 LDA #25
140 STA &70
150 STA &72
160 LDA #0
170 STA &71
180 RTS
190
200 .prog%
210 DEC &72
220 BNE End
230 LDA &70
240 STA &72
250 LDX #8
260 LDA &71
270 EOR #1
280 STA &71
290 BNE Off
300
310 LDY #7
320 .On
330 LDA #19 \VDU 19,X,Y;0;
340 JSR &FFEE
350 TXA
360 JSR &FFEE
370 TYA
380 JSR &FFEE
390 LDA #0
400 JSR &FFEE
410 JSR &FFEE
420 JSR &FFEE
430 INX
440 DEY
450 BNE On
460 RTS
470
480 .Off
490 LDA #19 \VDU 19,X,0;0;
500 JSR &FFEE
510 TXA
520 JSR &FFEE
530 LDA #0
540 JSR &FFEE
550 JSR &FFEE
560 JSR &FFEE
570 JSR &FFEE
580 INX
590 CPX #16
600 BNE Off
610 .End
620 RTS
630 ]
640 NEXT
650 CALL Flash:*FX9
660 PRINT"*FX14,4 = ON"
670 PRINT"*FX13,4 = OFF"
680 FOR i=8 TO 15
690 COLOUR i
700 PRINT"Colour ";i
710 NEXT
720 *FX14,4
730 COLOUR 3
```

FLASH OF INSPIRATION

JOHN WHIGHAM works out some new colour combinations for Mode 2

AS you know, there are eight steady and eight flashing colours in Mode 2.

Although any of these colours can be redefined using VDU 19 you can't choose the flashing combinations and you're stuck with either black/white, red/cyan, green/magenta and so on.

This utility shows how you can set up any colour combination and as an example sets colours 8 to 14 to flash red/black, green/black, yellow/black and so on.

The new colour combinations are shown in Table I. The colours 0 to 7 are as normal.

Enter Flashers, and save it, then run it and you'll see a demonstration. To stop the colours flashing enter:

```
*FX13,4
```

either directly from the keyboard or from within a program. You can restart them at any time with:

```
*FX14,4
```

The utility sets up an event routine which is called every time frame flyback occurs. The flash rate is stored in &70 and you can alter this by changing the 25 in line 130 or with:

```
?&70=flashrate
```

This location is a counter and when it reaches zero the colours are redefined using the machine code equivalent of VDU 19.

Using this technique you can now flash any colours you like. Try altering the 0 in line 530 to some other number and see what happens – the results are quite interesting.

8	White/Black
9	Cyan/Black
10	Magenta/Black
11	Blue/Black
12	Yellow/Black
13	Green/Black
14	Red/Black
15	Black/Black

Table I: The new flashing colour combinations.

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Power Pack	9.95	7.75
10 Computer Hits 3	9.95	7.75
5 Computer Hits	6.95	5.95
5 Star Games	9.95	7.75
5 Star Games 2	9.95	7.75
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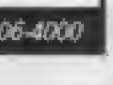

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CUBIT

By KEN GOODACRE

MANY years ago in ancient Egypt a mighty king called Khufu was building a great pyramid – it's the kind of thing that mighty kings did in ancient Egypt as canals hadn't been invented.

Unfortunately, the workers have gone on strike and the pyramid is behind schedule.

You can help Khufu build his pyramid by filling the tops of the cubits.

Don't let Khufu's slave drivers catch you sleeping on the job or you'll be thrown in the dungeons. And be careful of inadvertently jumping off the edge.

There are two lifts that you can use on either side of the pyramid. If you jump on to one of these you'll be taken up to the top.

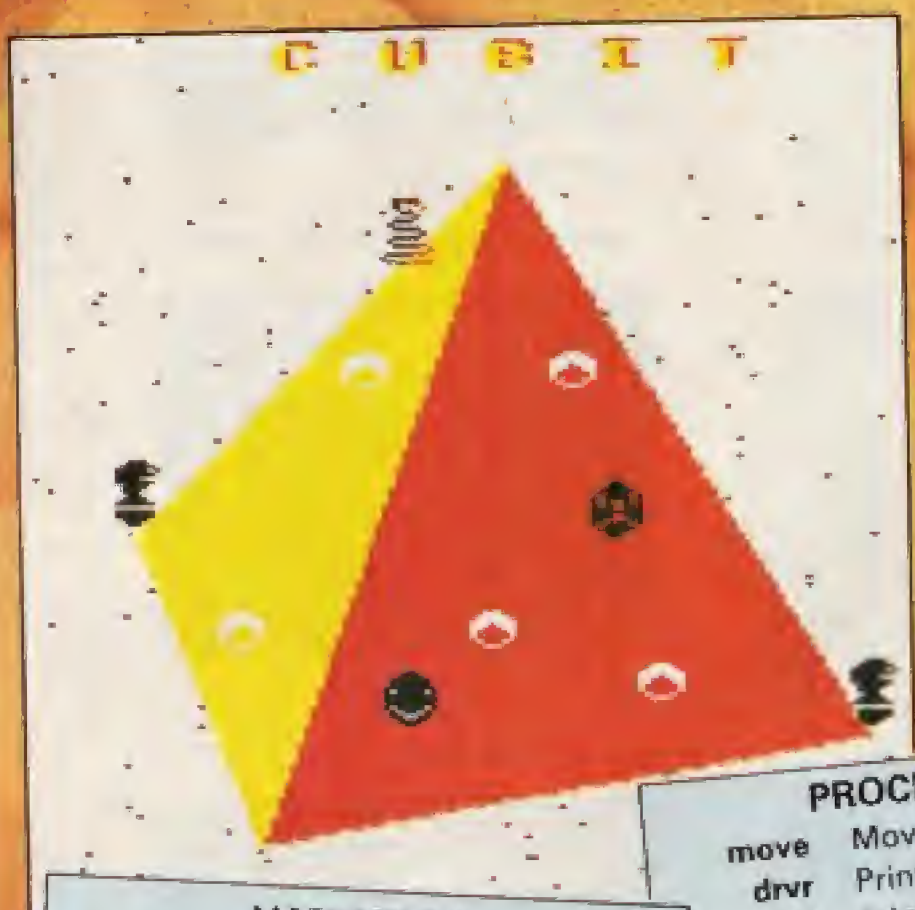
There are many screens, each becoming progressively more difficult. After the first three you'll find that the slave driver will change into an egg when he reaches the bottom of the pyramid and will be transmuted into a snake.

This vicious viper will follow you around the pyramid with venomous intent. If it catches you, you'll lose a life.

However, with practice you can lure the snake towards one of the lifts and if you're lucky it will jump off the pyramid as you jump on to the lift. This will earn you an extra 500 bonus points.

From the eleventh screen onwards a hole will appear in each filled cubit the snake lands on. Be careful not to drop in any of these air shafts or you'll lose a life.

After 15 screens only half the tops will be filled, and on completion of a screen you'll be credited with these and be able to start again, filling in the second half.



VARIABLES

BX%,BY%	Slave driver's coordinates.
C%	Colour of cubes.
F%	Number of cube tops filled.
L%	Number of lives left.
SC%	Score.
sx%,sy%	Snake's coordinates.
X%,Y%	Man's coordinates.
B$	Slave driver.
Q$	Man.
S$	Snake.

PROCEDURES

move	Move man.
drvr	Print driver.
sid	Print snake.
fil	Fill cubit.
mdrvr	Move slave driver.
lift	Operate the lift.
hatch	Hatch the snake.
screen	Draw screen.
cube	Draw pyramid.

Full listing starts on Page 23

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Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 53

From Page 21

```
  10 REM    C U B I T
  20 REM  By Ken Goodacre
  30 REM (c) Electron User
  60 *FX200,1
  70 ON ERROR GOTO5160
  80 PROCinit:PROCpos:*FX16
  90 *FX200,0
 100 MODE5:VDU5:VDU23;8202;0;
0;0;
 110 PROCtitle:PROCw(100):CLG
 120 MODE4:VDU23;8202;0;0;0;
 130 VDU19,0,4;0;19,1,3;0;
 140 PROCborder:MOVE300,950:D
RAW950,950
 150 DRAW950,850:DRAW300,850:
DRAW300,950
 160 RESTORE5000:PROCdble(85C
28,24)
 170 PRINTTAB(2,10)"The objec
t is to fill the cube tops."
 180 PRINTTAB(2,12)"Be carefu
l not to jump off the edge,"
 190 PRINTTAB(1,14)"and avoid
 the slave drivers. Lure the"
 200 PRINTTAB(1,16)"snake off
 the pyramid by attracting it"
 210 PRINTTAB(1,18)"to the ed
ge and then jumping on to the"
TAB(1,20)"lift."TAB(14,28)"Pre
ss space"
 220 REPEAT UNTIL INKEY-99
 230 MODE4:VDU23;8202;0;0;0;
 240 *FX202,0
 250 PROCshowkeys
 260 IFGET$="Y"MODE5:PROCkeys
 270 MODE5:VDU5:VDU23;8202;0;
0;0;
 280 CX=1:LX=3:QX=1:fX=0:f4X
=0:PX=0
 290 SCX=0:SCR%=1:TX=0:UX=0:*
FX202,0
 300 BX=0:f1X=0:f2X=0:hxX=0:h
yX=0
 310 FX=0:HX=0:sxX=0:syX=0:IX
=-16
 320 IFQX=3PROCadvance
 330 VDU19,1,P1X(PX),0,0,0
 340 VDU19,2,P2X(PX),0,0,0
 350 PROCscreen
 360 IFf3X=1AND14X=1PROCrefil
:ZX=16
 370 GCOL3,1:*FX21
 380 PLOT69,1040,360
 390 PLOT69,240,360
 400 MOVE1040-32,440:PRINTL$
 410 MOVE240-32,440:PRINTL$
 420 bX=RND(2):PROCdrvr
 430 QX=0:PROCmdrvr:PROCjoe
 440 REPEAT:bX=RND(2)
 450 IFHX=0BX=BX+1
 460 K$=INKEY$(0)
 470 IFK$=dr$PROCdr
 480 IFK$=ul$PROCul
 490 IFK$=dl$PROCdl
 500 IFK$=ur$PROCur
 510 PROCmdrvr
 520 IFf1X=1PROClift
 530 IFf2X=1PROCsnake
 540 IFBX=4ANDTX=1PROCset
 550 IFBX=14ANDTX=1PROChatch
 560 IFfX=21QX=3
 570 UNTIL QX>0
 580 IFQX=3:PROCscore:CLG:GOT
O300
 590 IFQX=2SOUND1,5,180,5:PRO
Cjoe:MOVEXX-48,YX+28:PRINTQ$:Q
X=0:PROCmdrvr
 600 IFBXX=sxXANDBYX=syXPROCm
drvr:PROCwink ELSE PROCwink
 610 PROClost:IFLX>0CLS:GOTO3
00
 620 IFSQX=1RESTORE4570:PROCp
lay(20,10)ELSE PROCw(50)
 630 QX=0:CLG:MODE4:VDU23;820
2;0;0;0;
 640 VDU19,1,1;0;
 650 RESTORE5000:PROCdble(&66
10,16)
 660 PROCw(150):CLS:VDU19,1,3
;0;
 670 PROCsort:IFIX=0GOTO730
 680 SCX(MX)=SCX:PROCtable
 690 IfSQX=1PROCfanfare
 700 PRINTTAB(0,28)"Please en
ter your name":*FX21
 710 INPUTTAB(5,7+MX*2)SC$:SC
$(MX)=SC$
 720 IFLENSC$>23SC$(MX)="":CL
S:GOTO680
 730 PROCtable:PRINTTAB(5,28)
"Press space bar to start game
"
```

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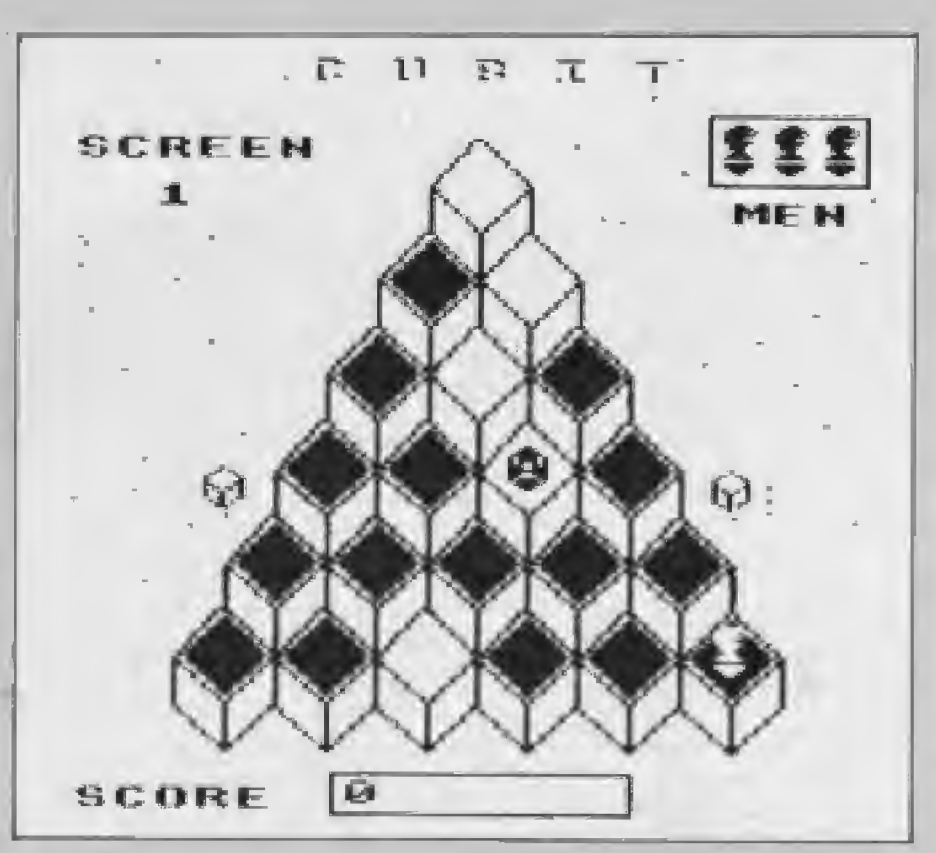
```
 740 REPEAT UNTIL INKEY-99:CL
G:GOTO270
 750 END
 760 :
 770 DEFPROCdr:RESTORE790
 780 PROCmove:ENDPROC
 790 DATA40,10 ,40,20 ,0,-150
 800 ;
 810 DEFPROCul:RESTORE830
 820 PROCmove:ENDPROC
 830 DATA-40,80 ,-40,70 ,0,-3
0
 840 :
 850 DEFPROCdl:RESTORE870
 860 PROCmove:ENDPROC
 870 DATA-40,10 ,-40,20 ,0,-1
50
 880 :
 890 DEFPROCur:RESTORE910
 900 PROCmove:ENDPROC
 910 DATA40,80 ,40,70 ,0,-30
 920 :
 930 DEFPROCmove:SOUND1,3,180
,2:*FX21
 940 FORAX=1TO3:PROCjoe
 950 READxX,yX:XX=XX+xX:YX=YX
+yX
 960 IFAX=3ANDPOINT(XX,YX-60)
=3PROCfil
 970 PROCjoe:NEXT
 980 PROCcheck:ENDPROC
 990 :
1000 DEFPROCjoe:MOVEXX-32,YX+
40
1010 PRINTQ$:ENDPROC
1020 :
1030 DEFPROCdrvr:MOVEBXX-32,B
YX+32
1040 PRINTB$:ENDPROC
1050 :
1060 DEFPROCsic:MOVEsxX-32,sy
X+40
1070 PRINTS$:ENDPROC
1080 :
1090 DEFPROCfil:GCOL0,CX
1100 IFf3X=1PROChalf:ENDPROC
1110 IFPOINT(XX,YX-12)>0ENDPR
OC
1120 MOVEXX-60,YX:MOVEXX,YX-4
6:FX=FX+1
1130 PLOT85,XX+70,YX:MOVEXX,Y
X+50
1140 PLOT85,XX-60,YX:SCX=SCX+
10:ENDPROC
1150 :
1160 DEFPROChalf
1170 IFf4X=1PROCfilt ELSE PRO
Cfilb
1180 ENDPROC
1190 :
1200 DEFPROCfilt
1210 IFPOINT(XX,YX+20)>0ENDPR
OC
1220 MOVEXX-30,YX-24:MOVEXX-6
0,YX
1230 PLOT85,XX,YX+50:MOVEXX+3
6,YX+26
1240 PLOT85,XX-30,YX-24:SCX=S
CX+30
1250 FX=FX+1:ENDPROC
1260 :
1270 DEFPROCfilb
1280 IFPOINT(XX,YX-12)>0ENDPR
OC
1290 MOVEXX+36,YX+26:MOVEXX+7
0,YX
1300 PLOT85,XX,YX-46:MOVEXX-3
0,YX-24
1310 PLOT85,XX+36,YX+26:SCX=S
CX+20
1320 FX=FX+1:ENDPROC
1330 :
1340 DEFPROCmdrvr:IfQX>0ENDPR
OC
1350 SOUND0,3,4,3
1360 IfbX=1RESTORE1430ELSERES
TORE1440
1370 IFBYX=200PROCdrvrfall:EN
DPROC
1380 FORAX=1TO3:PROCdrvr:READ
xX,yX
1390 BXX=BXX+xX:BYX=BYX+yX
1400 PROCdrvr:PROCw(WX):NEXT
1410 IFXX=BXXANDYX=BYXOX=2
1420 ENDPROC
1430 DATA40,10 ,40,-60 ,0,-70
1440 DATA-40,10 ,-40,-60 ,0,-
70
1450 :
1460 DEFPROCcheck:fIX=0:WX=4
1470 IFPOINT(XX,YX-60)<3PROCe
xam:ENDPROC
1480 IFXX=BXXANDYX=BYXOX=2:EN
DPROC
1490 IFXX=hxXANDYX=hyXOX=2:EN
DPROC
1500 IFXX=sxXANDYX=syXOX=2:12
X=0:ENDPROC
1510 IFPOINT(XX+24,YX)=0PROCd
rop:QX=1
1520 ENDPROC
1530 :
1540 DEFPROCexam
1550 IFPOINT(XX,YX-60)=16COL3
,1:PLOT69,XX,YX-60:fIX=1:WX=2:
PROCtongue:ENDPROC
1560 PROCjoefall:QX=1:ENDPROC
1570 :
1580 DEFPROCtongue:SOUND0,5,2
,4
1590 MOVEXX-32,YX+40:VDU238:P
ROCw(25)
1600 MOVEXX-32,YX+40:VDU238:E
NDPROC
1610 :
1620 DEFPROClift
1630 IFYX=920ANDBYX=680PROCto
p:ENDPROC
1640 IfYX=920ENDPROC
1650 PROCjoe
1660 MOVEXX-32,YX:PRINTL$
1670 IFXX>640XX=XX-80ELSEXX=X
X+80
1680 YX=YX+120:PROCjoe
1690 MOVEXX-32,YX:PRINTL$
1700 ENDPROC
1710 :
1720 DEFPROCtop:SOUND&0011,9,
50,10
1730 IFXX>640PROCdl ELSE PROC
dr:*FX21
1740 f1X=0:WX=4:ENDPROC
1750 :
1760 DEFPROCset:hxX=BXX:hyX=B
YX
1770 MOVEBXX-32,BYX+32:PRINTM
$
1780 BXX=640:BYX=800:PROCdrvr
1790 IFXX=BXXANDYX=BYXOX=2
1800 ENDPROC
1810 :
1820 DEFPROChatch:MOVEhxX-32,
hyX+32
1830 PRINTE$:sxX=hxX:syX=hyX
1840 SOUND0,1,5,2
1850 PROCsid:BX=0:HX=1:f2X=1
1860 hxX=0:hyX=0:ENDPROC
```

From Page 23

```
 1870 :
 1880 DEFPROCsnake
 1890 S%=S%+RND(20):IFS%<20ENDPROC
 1900 IFX%<=sx%ANDY%>=sy%RESTORE830:PROCchase:ENDPROC
 1910 IFX%>sx%ANDY%>=sy%RESTORE910:PROCchase:ENDPROC
 1920 IFX%<=sx%ANDY%<sy%RESTORE870:PROCchase:ENDPROC
 1930 IFX%>sx%ANDY%<sy%RESTORE790:PROCchase:ENDPROC
 1940 ENDPROC
 1950 :
 1960 DEFPROCchase:S%=0
 1970 IFPOINT(sx%,sy%+2%)=C%ANDU%=1PROCsid:MOVEsx%-20,sy%+40:PRINTH$:PROCsid
 1980 SOUND1,9,120,5:FORA%=1TO3:PROCsid
 1990 READx%,y%:sx%=sx%+x%:sy%=sy%+y%
 2000 PROCsid:PROCw(1):NEXT
 2010 IFPOINT(sx%,sy%-60)=0PROCsidfall
 2020 IFX%=sx%ANDY%=sy%OR%=2:f2%=0
 2030 ENDPROC
 2040 :
 2050 DEFPROCdrvrfall:REPEAT
 2060 PROCdrvr:PROCw(1)
 2070 BY%=BY%-50:PROCdrvr:UNTILBY%<=0
 2080 !f0%=10ANDT%=1MOVEhx%-32,hy%+32:PRINTJ$:SOUND1,6,0,2
 2090 PROCdrvr:BX%=640:BY%=800:PROCdrvr
 2100 IFX%=BX%ANDY%=BY%OR%=2
 2110 ENDPROC
 2120 :
 2130 DEFPROCjoefall:SOUND1,8,120,20
 2140 REPEAT:PROCjoe
 2150 Y%=Y%-40:PROCjoe:PROCw(3)
 2160 UNTILPOINT(XX,YX-60)=3ORY%<20
 2170 PROCjoe:IFY%<20SOUND0,4,4,0:PROCw(80):f1%=0:f2%=0:ENDPROC
 2180 w%=(Y%-200)/5
 2190 MOVEX%-32,Y%:VDU227:PROCw(6)
 2200 MOVEX%-32,Y%:VDU227:PROCw(w%)
 2210 SOUND0,4,4,0:PROCw(80)
 2220 f1%=0:f2%=0:ENDPROC
 2230 :
 2240 DEFPROCdrop:SOUND1,7,120,5
 2250 PROCjoe
 2260 MOVEX%-32,Y%:VDU227:PROCw(6)
 2270 MOVEX%-32,Y%:VDU227:PROCw(70)
 2280 IFSO%=1PROCweasel
 2290 SOUND0,4,4,0:PROCw(80)
 2300 f1%=0:f2%=0:ENDPROC
 2310 :
 2320 DEFPROCsidfall:SOUND1,6,80,10
 2330 ssx%=sx%:ssy%=sy%+60
 2340 MOVEssx%,ssy%:PRINTS0$
 2350 SC%=SC%+500:REPEAT:PROCsid
 2360 sy%=sy%-40:PROCsid:PROCw(3)
```




```
 2370 UNTILPOINT(sx%,sy%-60)=30Rsy%<20
 2380 MOVEssx%,ssy%:PRINTS0$
 2390 PROCsid:IFsy%<20f2%=0:ENDPROC
 2400 MOVEsx%-32,sy%:VDU229:PROCw(6)
 2410 MOVEsx%-32,sy%:VDU229
 2420 f2%=0:ENDPROC
 2430 :
 2440 DEFPROCwink:PROCw(40)
 2450 MOVEBX%-32,BY%+32:PRINTJ$
 2460 PROCw(30):SOUND1,1,220,1
 2470 MOVEBX%-32,BY%+32:VDU245:PROCw(40)
 2480 MOVEBX%-32,BY%+32:VDU245:ENDPROC
 2490 :
 2500 DEFPROCscreen:PROCstars:R%=0
 2510 GCOL0,1:MOVE1035,700:PRINT"MEN"
 2520 MOVE0,860:PRINT"SCREEN"
 2530 MOVE0,32:PRINT"SCORE"
 2540 MOVE1000,805:DRAW1000,895
 2550 DRAW1250,895:DRAW1250,805
 2560 DRAW1000,805:MOVE410,0
 2570 DRAW410,55:DRAW800,55
 2580 DRAW800,0:DRAW410,0:sc%=SC%
 2590 MOVE370,960:PRINTA$
 2600 GCOL0,2:MOVE430,40:PRINTSC%
 2610 MOVE365,958:PRINTA$
 2620 MOVE130,800:PRINTSCR%
 2630 FORA%=1TOL%:MOVE1020+R%,880
 2640 PRINTQ$:R%=R%+80:NEXT:ENDPROC
 2650 :
 2660 DEFPROCstars:GCOL0,3:FORA%=1TO100
 2670 PLOT69,RND(1279),RND(943)+80:NEXT
 2680 GCOL0,0:MOVE640,1023:MOVE1279,80
 2690 PLOT85,0,80:PROCcube:ENDPROC
 2700 :
 2710 DEFPROClost:R%=0:FORA%=1TOL%
 2720 MOVE1020+R%,880:PRINTQ$:R%=R%+80
 2730 NEXT:L%=L%-1:IFL%=0GOTO2760
 2740 R%=0:FORA%=1TOL%:MOVE1020+R%,880
 2750 PRINTQ$:R%=R%+80:NEXT
 2760 GCOL3,2:MOVE430,40:PRINTsc%
 2770 MOVE430,40:PRINTSC%
 2780 PROCw(100):ENDPROC
 2790 :
 2800 DEFPROCscore:GCOL3,2:MOVE430,40
 2810 PRINTsc%:FORA%=sc%TO$(%STEP50
 2820 MOVE430,40:PRINTA%
 2830 MOVE430,40:PRINTA%:NEXT
 2840 MOVE430,40:PRINTSC%
 2850 SOUND1,3,200,15:PROCw(100):ENDPROC
 2860 :
 2870 DEFPROCcube:X%=640:Y%=800:GCOL0,3
 2880 i%=0:o%=0:FORc%=1TO6:XX=X%-o%
 2890 FORr%=0TOi%:MOVEX%,Y%+60
 2900 FORA%=1TO4:x%=X%+80*x(A%)
 2910 y%=Y%+60*y(A%):DRAWx%,y%
 2920 IFA%<>4DRAWx%,y%-60:MOVEx%,y%
 2930 NEXT:XX=XX+160:NEXT:X%=640
 2940 o%=o%+80:Y%=Y%-120:i%=i%+1
 2950 NEXT:X%=240:Y%=Y%+60:FORr%=0TO5
 2960 MOVEX%+80*x(1),Y%+60*y(1)
 2970 FORA%=1TO3:x%=X%+80*x(A%)
 2980 y%=Y%+60*y(A%):DRAWx%,y%:NEXT
 2990 X%=X%+160:NEXT:X%=640:Y%=800
 3000 BX%=X%:BY%=Y%:ENDPROC
 3010 :
 3020 DEFPROCpos
 3030 X%=640:Y%=800:i%=0:o%=0:q%=0
 3040 FORc%=1TO6:X%=X%-o%
 3050 FORr%=0TOi%:px%(q%)=X%:py%(q%)=Y%
 3060 q%=q%+1:X%=X%+160:NEXT:X%=640
 3070 o%=o%+80:Y%=Y%-120:i%=i%+1:NEXT
 3080 ENDPROC
 3090 :
 3100 DEFPROCrefil:GCOL0,1
 3110 FORA%=0TO20:X%=px%(A%):Y%=py%(A%)
 3120 SOUND&0010,1,4,1:PROCw(4):PROCfilb
 3130 NEXT:X%=640:Y%=800:F%=0:ENDPROC
 3140 :
 3150 DEFPROCadvance:SCR%=SCR%+1
 3160 Q%=Q%+1:IFQ%>250%=1%:F3%=0:f4%=0
 3170 IFQ%=6T%=1
 3180 IFQ%=1%U%=1
 3190 IFQ%=16f3%=1
 3200 IFQ%>16f4%=f4%-1:IFf4%<0f4%=1
 3210 IFf4%<>1P%=P%+1:IFP%>4P%=0
 3220 IFf3%=1ANDU%=1C%=2ELSEC%=1
 3230 ENDPROC
 3240 :
 3250 DEFPROCinit:@%=0:*FX210,0
 3260 DIMx(4):DIMy(4):*fX11,0
 3270 DIMSC$(10):DIMSC%(10)
 3280 DIMpx%(20):DIMpy%(20)
 3290 DIMP1%(4):DIMP2%(4):*FX4,2
 3300 B%=4000:RESTORE4100:FORA%=0TO9
 3310 READA$:SC$(A%)=A$:SC%(A%)=B%
 3320 B%=B%-300:NEXT:BX%=782:BY%=468
 3330 d%=2:f1%=0:f2%=0:hx%=0:hy%=0
 3340 O%=0:S%=0:SO%=1:sx%=0:sy%=0:w%=4
 3350 ENVELOPE1,0,0,0,0,0,0,0,0,80,-8,-2,-4,120,120
 3360 ENVELOPE2,3,1,-1,1,1,1,1,121,-10,-5,-2,120,120
 3370 ENVELOPE3,1,1,0,2,2,2,2,5,-2,-2,-2,120,120
 3380 ENVELOPE4,3,0,0,0,0,0,0,0,121,-10,-1,-2,120,120
 3390 ENVELOPE5,129,-50,-6,-12,11,17,172,126,0,0,-126,126,126
 3400 ENVELOPE6,2,2,1,5,1,2,5,126,0,0,-2,126,126
 3410 ENVELOPE7,0,2,84,57,25,25,25,12,0,0,-2,126,126
 3420 ENVELOPE8,3,1,8,1,22,10,21,51,0,0,-2,90,126
 3430 ENVELOPE9,0,6,8,5,2,2,2,12,0,0,-2,90,126
 3440 VDU23,224,255,231,195,189,126,60,24,0
 3450 VDU23,225,0,24,60,126,189,189,165,231
 3460 VDU23,226,0,0,0,129,129,66,60,60
 3470 VDU23,227,28,62,125,126,120,126,60,56
```

```
 3480 VDU23,228,24,60,126,0,12
6,126,60,24
 3490 VDU23,229,60,32,32,24,4,
56,64,60
 3500 VDU23,230,2,60,64,62,1,1
26,128,127
 3510 VDU23,231,32,32,112,180,
247,255,127,56
 3520 VDU23,232,160,176,184,18
4,184,184,176,160
 3530 VDU23,233,0,0,14,8,14,2,
2,14
 3540 VDU23,234,0,0,238,170,17
0,170,170,238
 3550 VDU23,235,24,36,66,129,1
29,195,165,153
 3560 VDU23,236,145,145,82,52,
24,0,0,0
 3570 VDU23,237,0,12,2,0,0,0,0
,0
 3580 VDU23,238,0,0,0,0,3,1,0,
0
 3590 VDU23,239,0,24,60,195,0,
0,0,0
 3600 VDU23,240,0,0,0,0,195,66
,90,24
 3610 VDU23,241,255,255,255,12
6,126,60,24,0
 3620 VDU23,242,0,24,60,126,12
6,255,255,255
 3630 VDU23,243,0,0,66,36,24,0
,0,0
 3640 VDU23,244,0,0,0,0,0,0,66
,0
 3650 VDU23,245,0,0,0,0,2,0,0,
0
 3660 VDU23,246,0,24,60,126,12
6,255,189,255
 3670 VDU23,247,255,255,189,90
,102,60,24,0
 3680 VDU23,254,0,0,0,0,0,0,0,
56
 3690 VDU23,255,124,254,238,19
8,130,130,68,56
 3700 ul$="A":ur$="":dl$="/":
dr$="Z"
 3710 A$="C U B ] T"
 3720 b$=CHR$10+CHR$0+CHR$3+CH
R$225+CHR$8+CHR$10+CHR$224
 3730 B$=CHR$10+CHR$4+CHR$2+CH
R$225+CHR$8+CHR$10+CHR$224
 3740 D$=CHR$10+CHR$3+CHR$3+CH
R$231+CHR$232
 3750 e$=CHR$10+CHR$0+CHR$3+CH
R$242+CHR$8+CHR$10+CHR$241
 3760 E$=CHR$10+CHR$4+CHR$2+CH
R$242+CHR$8+CHR$10+CHR$241
 3770 EJ$=CHR$10+CHR$4+CHR$2+C
HR$246+CHR$8+CHR$10+CHR$247
 3780 H$=CHR$10+CHR$0+CHR$0+CH
R$254+CHR$8+CHR$10+CHR$255
 3790 J$=CHR$10+CHR$4+CHR$2+CH
R$244+CHR$8+CHR$10+CHR$243
 3800 L$=CHR$10+CHR$3+CHR$2+CH
R$235+CHR$8+CHR$10+CHR$236
 3810 M$=CHR$10+CHR$4+CHR$2+CH
R$240+CHR$8+CHR$10+CHR$239
 3820 Q$=CHR$10+CHR$3+CHR$3+CH
R$227+CHR$8+CHR$10+CHR$228
 3830 S$=CHR$10+CHR$3+CHR$1+CH
R$237+CHR$10+CHR$3+CHR$3+CHR$8
+CHR$229+CHR$8+CHR$10+CHR$230
 3840 SB$=CHR$10+CHR$3+CHR$2+C
HR$233+CHR$234
 3850 B%=0:FORA%=0TO360STEP90
 3860 x(B%)=SIN(RAD(A%))
 3870 y(B%)=COS(RAD(A%))
 3880 B%=B%+1:NEXT:RESTORE3930
 3890 FORA%=0TO4:READP1%,P2%
 3900 P1%(A%)=P1%:P2%(A%)=P2%:
NEXT
 3910 ENDPROC
 3920 :
 3930 DATA1,3,2,4,4,3,5,2,6,4
 3940 :
 3950 DEFPROCw(p%):TIME=0
 3960 REPEAT UNTIL TIME>=p%:EN
DPROC
 3970 :
 3980 DEFPROCtable:PROCborder
 3990 RESTORE5100:PROCdble(&5A
90,16)
 4000 PRINTTAB(2,5);STRING$(18
," ")
 4010 y%=7:FORA%=0TO9:D%=26-LE
N$(A%)
 4020 PRINTTAB(5,y%)S$(A%);ST
RING$(D%,".");SC%(A%):y%=y%+2:
NEXT:ENDPROC
 4030 :
 4040 DEFPROCsort:I%=0:M%=0:FO
RA%=0TO9
 4050 IFSC%>SC%(A%)MI=A%:A%=9:
I%=1
 4060 NEXT:IFI%=0:ENDPROC
 4070 FORA%=9TOM%STEP-1
 4080 S$(A%+1)=S$(A%):SC%(A%
+1)=SC%(A%):NEXT:S$(M%)="":SC
%(M%)=SC%:ENDPROC
 4090 :
 4100 DATASpot,Jiffy,Tigger,Pa
ul,David,Nigel,Spoon,Badger,Gi
nger,Nelson
 4110 :
 4120 DEFPROCshowkeys:SO%=1:*F
X210,0
 4130 VDU19,1,3;0;19,0,4;0;:*F
X21
 4140 PROCborder
 4150 PRINTTAB(3,12)"Do you wa
nt the sound turning off?"TAB(
16,20)"[ Y/N ]"
 4160 IFGET$="Y"SO%=0:*FX210,1
 4170 CLS:PROCborder
 4180 PRINTTAB(14,3)"The keys
are"TAB(14,4)"—— —— ——"TAB
(16,28)"[ Y/N ]"
 4190 PRINTTAB(4,10)"Up left =
"ul$;SPC(8)"Up right = "ur$;T
AB(3,16)"Down left = "dl$;SPC(
6)"Down right = "dr$;TAB(6,23)
"Do you wish to change them?"
 4200 ENDPROC
 4210 :
 4220 DEFPROCkeys:VDU23;8202;0
;0;0;
 4230 C%=1:I3%=0:I4%=0:VDU28,0
,4,19,0
 4240 PROCcube:COLOUR2:PRINTTA
B(1,1)"PRESS KEY REQUIRED"TAB(
6,3)"FOR JUMP":VDU5
 4250 X%=640:Y%=560:PROCjoe:*f
X21
 4260 PROCw(50):PROCur:ur$=GET
$
 4270 MOVEX%+50,Y%+60:PRINTur$
 4280 X%=640:Y%=560:PROCjoe
 4290 PROCw(20):PROCul:ul$=GET
$
 4300 MOVEX%-110,Y%+60:PRINTul
$
 4310 X%=640:Y%=560:PROCjoe
 4320 PROCw(20):PROCdr:dr$=GET
$
 4330 MOVEX%+210,Y%+60:PRINTdr
$
 4340 X%=640:Y%=560:PROCjoe
 4350 PROCw(20):PROCdl:dl$=GET
$
 4360 MOVEX%-270,Y%+60:PRINTdl
$
 4370 PROCw(80):VDU4:VDU23;820
2;0;0;0;
 4380 CLS:PRINTTAB(0,1)"PRESS
SPACE TO START"TAB(8,3)"GAME":
SC%=0
 4390 REPEAT UNTIL INKEY-99:CL
G:ENDPROC
 4400 :
 4410 DEFPROCplay(q,pitch)
 4420 FORB=1TOq:READA,D,P:TIME
=0
 4430 P=P+pitch
 4440 IFA<>0REPEAT:SOUND&0011,
A,P,1:UNTILTIME>=D
 4450 IFA=0REPEATUNTILTIME>=D
 4460 NEXT:ENDPROC
 4470 :
 4480 DEFPROCegypt:RESTORE4510
 4490 PROCplay(44,-30):ENDPROC
 4500 :
 4510 DATA0,0,0,3,40,73,0,0,0,
3,34,81
 4520 DATA0,2,0,3,63,85,0,4,0,
3,62,81
 4530 DATA0,5,0,3,45,73,0,17,0
,3,27,73
 4540 DATA0,5,0,3,35,81,0,2,0,
3,23,85
 4550 DATA0,5,0,3,24,101,0,4,0
,3,33,81
 4560 DATA0,2,0,3,28,85,0,3,0,
3,57,73
 4570 DATA0,1,0,3,17,85,0,13,0
,3,11,93
 4580 DATA0,21,0,3,46,101,0,17
,0,3,10,101
 4590 DATA0,22,0,3,13,105,0,24
,0,3,0,101
 4600 DATA0,24,0,3,10,93,0,19,
0,3,17,81
 4610 DATA0,13,0,3,14,85,0,28,
0,3,110,73
 4620 :
 4630 DEFPROCweasel:RESTORE466
0
 4640 PROCplay(18,100):ENDPROC
 4650 :
 4660 DATA0,0,0,1,7,53,0,1,0,1
,5,61
 4670 DATA0,1,0,1,3,69,0,1,0,1
,2,73
 4680 DATA0,1,0,1,4,81,0,46,0,
1,7,61
 4690 DATA0,24,0,1,6,73,0,8,0,
1,5,69
 4700 DATA0,43,0,1,4,53,0,43,0
,4,3,53
 4710 :
 4720 DEFPROCfanfare:RESTORE47
50
 4730 PROCplay(36,10):ENDPROC
 4740 :
 4750 DATA0,1,0,1,19,73,0,13,0
,1,7,73
 4760 DATA0,13,0,1,6,73,0,13,0
,1,9,73
 4770 DATA0,0,0,1,10,53,0,9,0,
1,13,73
 4780 DATA0,12,0,1,24,89,0,12,
0,1,7,89
 4790 DATA0,12,0,1,5,89,0,12,0
,1,9,89
 4800 DATA0,9,0,1,12,73,0,13,0
,1,12,89
 4810 DATA0,13,0,1,23,101,0,12
,0,1,9,101
 4820 DATA0,13,0,1,10,101,0,9,
0,1,15,101
 4830 DATA0,20,0,1,30,101,0,9,
0,1,92,121
 4840 :
 4850 DEFPROCtitle:GCOL0,3:FOR
A%=0TO200
 4860 PLOT69,RND(1279),RND(102
3):NEXT
 4870 GCOL0,1:MOVE350,150:DRAW
640,800:PLOT85,1079,250:GCOL0,
2:MOVE350,150:DRAW200,450:PLOT
85,640,800
 4880 MOVE500,770:PRINTS$:MOVE
500,320:PRINTe$:MOVE750,500:PR
INTb$
 4890 MOVE600,400:PRINTH$:MOVE
700,650:PRINTH$:MOVE450,650:PR
INTH$:MOVE300,400:PRINTH$:MOVE
800,350:PRINTH$:GCOL0,1
 4900 MOVE370,920:PRINTA$:GCOL
0,2
 4910 MOVE365,918:PRINTA$
 4920 MOVE360,990:PRINTQ$:MOVE
880,990:PRINTQ$:MOVE620,990:PR
INTQ$:PROCegypt
 4930 MOVE620,990:PRINTQ$:MOVE
360,990:PRINTQ$:MOVE880,990:PR
INTQ$:MOVE170,520:PRINTQ$:MOVE
1050,320:PRINTQ$:SOUND1,7,90,5
 4940 MOVE600,400:PRINTQ$:X%=6
32:Y%=360
 4950 MOVE500,320:PRINTJ$:PROC
drop
 4960 PROCwink:ENDPROC
 4970 :
 4980 DEFPROCdble(start%,st%):
inc%=0
 4990 READna$:FORA%=1TOLENna$
 5000 asc%=ASC(MID$(na$,A%,1))
 5010 ad%=&8F00+(asc%*8):po%=s
tart%+inc%
 5020 sta%=0:fin%=3:FORloop%=1
TO2
 5030 FORpe%=ad%+sta%TOad%+fin
%
 5040 ?po%=?pe%:?(po%+1)=?pe%:
po%=po%+2
 5050 NEXT:po%=po%+312:sta%=4:
fin%=7
 5060 NEXT:inc%=inc%+st%:NEXT:
ENDPROC
 5070 :
 5080 DATA"CUBIT"
 5090 DATA"GAME OVER"
 5100 DATA"CUBIT HALL OF FAME"
 5110 :
 5120 DEFPROCborder:MOVE0,0:DR
AW0,1023
 5130 DRAW1279,1023:DRAW1279,0
:DRAW0,0
 5140 ENDPROC
 5150 :
 5160 IF ERR=17 GOTO230
 5170 MODE6:*FX21
 5180 VDU14:*FX12
 5190 *FX200,0
 5200 *FX4,0
 5210 REPORT:PRINT" at line ";
ERL
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

ETERNAL TRIANGLES

Part 16 of the Electron graphics series by TREVOR ROBERTS

STRAIGHT down to work this month. Try running Program I, a piece of code which uses one of a new family of PLOTs to produce a yellow triangle.

```
10 REM Program I
20 MODE 1
30 GCOL 0,2
40 PLOT 4,100,100
50 PLOT 4,900,100
60 PLOT 85,450,800
```

Program I

The first three lines of the program should pose no problems. Line 10 is a labelling REM, while lines 20 and 30 select Mode 1 and tell the Electron to use yellow as the foreground colour.

The next two lines use PLOT 4 – which you'll remember as a version of MOVE – to get the graphics cursor to visit points 100,100 and 900,100 in turn. The plot then thickens as we come to line 60.

If the program had ended at line 50, all we achieve is to move the invisible cursor a couple of times and be left with a blank screen.

Line 60, however, makes a lot of difference. As soon as the micro executes it, a yellow triangle appears on the screen, the result of the PLOT 85.

PLOT 85 is one of a series of PLOTs that produce triangles filled with the current foreground graphics colour.

If you recall your geometry, you'll know that a triangle has three corners. Logically enough, PLOT 85 uses these three corners to decide where to draw the triangle.

It takes the point whose coordinates come after the PLOT, along with the previous two points that the graphics cursor has visited.

In this case points 100,100, 900,100 and 450,800 form the corners of the triangle.

While the fact that this family of PLOTs "remembers" the previous two coordinates of the graphics cursor may seem odd at first, it soon becomes second nature.

All the triangle PLOTs, shown in Table I, use the same method. And their behaviour corresponds to the PLOT families we've explored in earlier articles.

```
10 REM Program II
20 MODE 1
30 GCOL 0,2
40 PROCtriangle(85)
50 FOR delay=1 TO 300:NEXT
delay
60 PROCtriangle(87)
70 FOR delay=1 TO 300:NEXT
delay
80 PROCtriangle(85)
90 END
100 DEF PROCtriangle(code)
110 PLOT 84,100,100
120 PLOT 84,900,100
130 PLOT code,450,800
140 ENDPROC
```

Program II

Program II shows two of them in use, producing a triangle that appears, disappears, then appears again.

We won't go into the details of the program, it should be fairly obvious by now. PROCtriangle consists of the core of Program I with the differing values of *code* using PLOT 85 to draw a triangle and PLOT 87 to "erase" it.

We're not confined to absolute values for our coordinates. As before we can have relative values.

Program III uses a variant of PROCtriangle, which employs PLOTs 80 and 81 to draw the triangle. With it you can put an isoceles triangle at point *x,y*.

Program IV has this same PROCtriangle producing a trail of triangles slanting diagonally upwards across the screen from left to right. Line 40 uses MOD to "rotate" the colours between yellow, white and red. Can you alter the program so that the diagonal of triangles goes the other way? A spot of palette switching using VDU19

```
10 REM Program III
20 MODE 1
30 GCOL 0,2
40 PROCtriangle(100,100)
50 END
60 DEF PROCtriangle(x,y)
70 PLOT 84,x,y
80 PLOT 80,200,0
90 PLOT 80,-100,200
100 PLOT 81,-100,-200
110 ENDPROC
```

Program III

```
10 REM Program IV
20 MODE 1
30 FOR loop=100 TO 800 STEP
100
40 GCOL 0, loop MOD 3 +1
50 PROCtriangle(loop,loop)
60 NEXT loop
70 END
80 DEF PROCtriangle(x,y)
90 PLOT 84,x,y
100 PLOT 80,200,0
110 PLOT 80,-100,200
120 PLOT 81,-100,-200
130 ENDPROC
```

Program IV

code	action
80	Move relative to last point
81	Draw relative to last point
83	Draw relative in background
84	Move absolute
85	Draw absolute
87	Draw absolute in background

Table I: PLOTting triangles

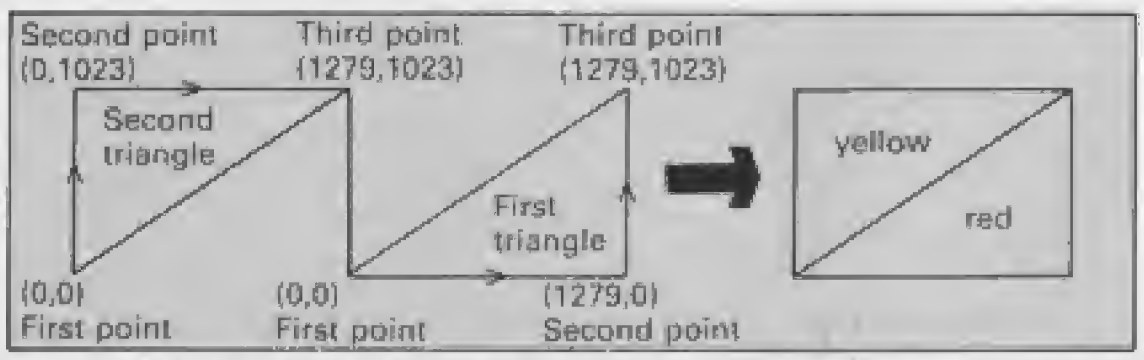


Figure I: Making a rectangle from two triangles

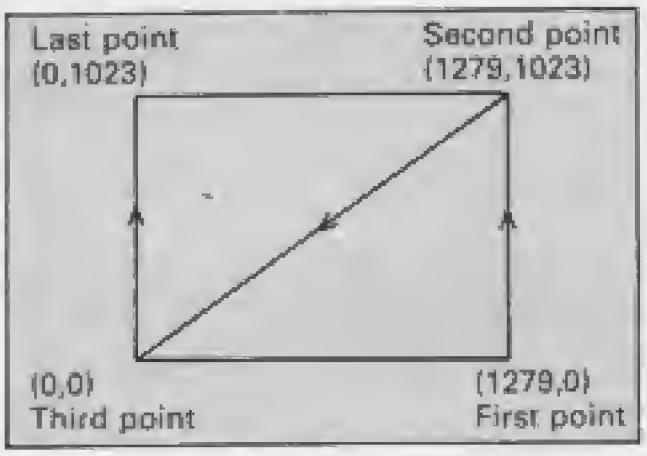


Figure II: An easier rectangle

might liven things up.

This ability to draw triangles is extremely valuable. With them you can make all sorts of things, even circles. For the moment, however, we'll content ourselves with producing another important geometric form, the rectangle.

If you think about it, a rectangle can be constructed from two triangles. Program V shows how it's done.

```
10 REM Program V
20 MODE 1
30 REM First triangle
40 GCOL 0,1
50 MOVE 0,0
60 MOVE 1279,0
70 PLOT 85,1279,1023
80 REM second triangle
90 GCOL 0,2
100 MOVE 0,0
110 MOVE 0,1023
120 PLOT 85,1279,1023
130 REPEAT UNTIL FALSE
```

Program V

The first triangle is produced in lines 50 to 70. Here two MOVEs and a PLOT 85 combine to produce the red triangle (ensured by the earlier GCOL). The program then goes on to create another triangle, this time a yellow one.

The last line is an endless loop whose sole purpose is to stop the prompt appearing. Press Escape when you've had enough.

Figure I shows how the triangles combine to form the rectangle. Of course in practice both triangles would be drawn in the same colour, producing a uniform rectangle.

Observant readers may have noticed that there are a couple of unnecessary MOVEs in the last program. Provided that we pick our points in the right order, we can do away with these, as Program VI demonstrates. Figure II illustrates the method.

```
10 REM Program VI
20 MODE 1
30 REM First triangle
40 GCOL 0,1
50 MOVE 1279,0
60 MOVE 1279,1023
70 PLOT 85,0,0
80 REM second triangle
90 GCOL 0,2
100 PLOT 85,0,1023
110 REPEAT UNTIL FALSE
```

Program VI

Program VII, our last one this month, uses PLOT 85 to produce two rectangles, one red, one yellow. Notice that they are created by different methods.

The first, employed in PROCfirst, uses the coordinates of one corner of the rectangle along with its height and width to make our colourful quadrilateral.

PROCsecond also gives us a rectangle, but this time it uses the coordinates of two opposite corners. Figures III and IV show how each method works.

Once you've understood them and their differences, see if you can replace the absolute PLOTs with relative ones. Which do you think is better?

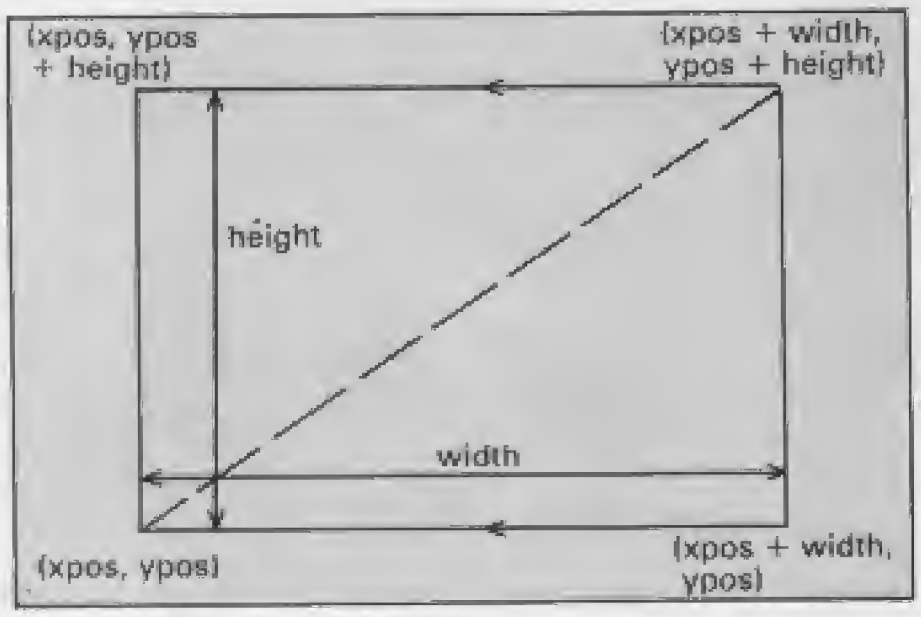


Figure III: First rectangle definition

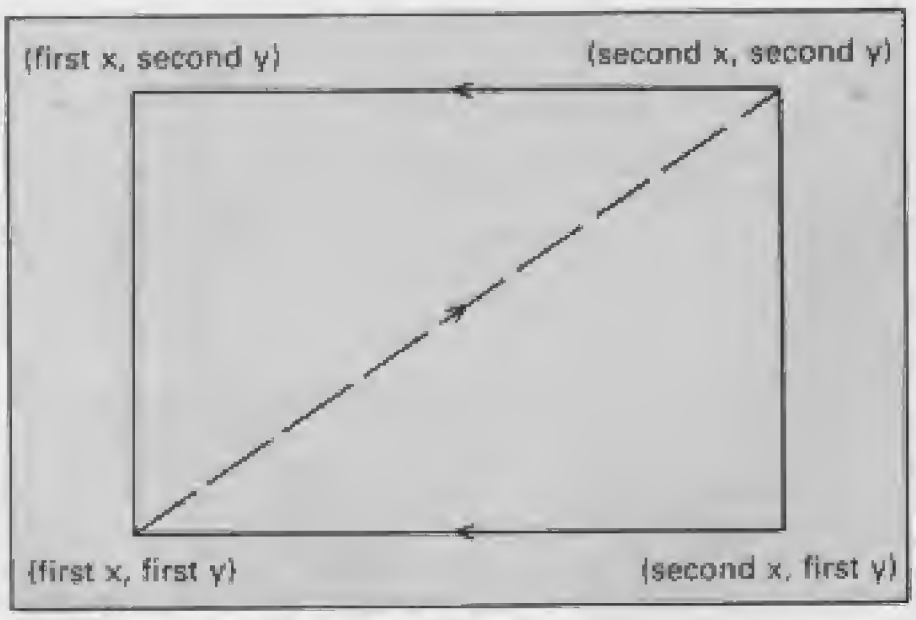


Figure IV: Second rectangle definition

```
10 REM Program VII
20 MODE 1
30 REM red rectangle using first method
40 PROCfirst(100,100,400,200,1)
50 REM yellow rectangle using second method
60 PROCsecond(500,500,900,700,2)
70 END
80 DEF PROCfirst(xpos,ypos,width,height,colour)
90 GCOL 0,colour
100 MOVE xpos+width,ypos
110 MOVE xpos,ypos
120 PLOT 85,xpos+width,ypos+height
130 PLOT 85,xpos,ypos+height
140 ENDPROC
150 DEF PROCsecond(firstx,firsty,secondx,secondy,colour)
160 GCOL 0,colour
170 MOVE secondx,firsty
180 MOVE firstx,firsty
190 PLOT 85,secondx,secondy
200 PLOT 85,firstx,secondy
210 ENDPROC
```

Program VII

And that's where we'll leave it for now. Table II lists all the PLOTs so far.

Now that we've covered filled triangles you'll find that your ability to construct pictures has increased enormously. Try using them to draw boats, rockets, even the circles mentioned earlier.

● *That should keep you busy until next time when we'll be leaving PLOTs and looking at other aspects of GCOL. It follows on logically.*

Solid	Dotted	One dot	Triangle	action
0	16	64	80	Move relative to last point
1	17	65	81	Draw relative to last point
3	19	67	83	Draw relative in background
4	20	68	84	Move absolute
5	21	69	85	Draw absolute
7	23	71	87	Draw absolute in background

Table II: PLOTs – the story so far

More great Electron games

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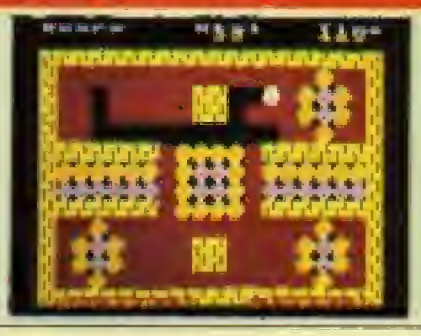

Rockfall: *Come diamond mining in this fun packed game with its own screen designer.*
Karate Warrior: *Win your black belt in this gruelling test of karate skill.*
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Invasion Force: *Can you survive wave after wave of relentlessly advancing aliens.*
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Manic Mole: *Watch out for melting platforms and conveyor belts in your quest for jewels.*
Skramble: *Fly your fighter fast and low over the landscape to penetrate enemy territory.*
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TO ORDER TURN TO THE FORM ON PAGE 53

Micros that think!

ROLAND WADDILOVE takes a first look at Lisp, the language used in artificial intelligence work

AFTER spending three months looking at View it's now time to move on to something completely different – the programming language Lisp.

This is available on tape or rom cartridge and the price has now fallen to just a few pounds for the tape version. It is inexpensive and widely available, so we'll see what it is and what it can be used for.

Unfortunately, Lisp is an unusual language and operates in a completely different manner from BBC Basic. It uses strange symbols and concepts, making it appear difficult to learn.

This isn't so and I hope to show how easy it can be by developing some simple Lisp programs and by exploring its commands and syntax.

I can't possibly cover the whole language in just a few short articles. What I intend to do is provide enough groundwork so that you can tackle the manual with confidence. (The manual – Lisp on the BBC Microcomputer by Norman and Cattell published by Acornsoft – isn't packaged with the tape or cartridge and must be bought separately).

I'm going to assume that you've either plugged in your rom cartridge or loaded the tape version of Lisp. This isn't necessary, but it will help if you try the examples as we progress.

Lisp has been around at least 20 years, and was invented by John McCarthy. It is one of the oldest computer languages and has been used for many projects such as writing compilers, editors and operating systems. But it's perhaps best known as the language used in artificial intelligence work.

Expert systems, computer reasoning and learning have all been implemented using Lisp.

It's not a great number cruncher, though it is possible to write excellent maths packages. It is a LISt Processing language and is designed to manipulate lists and symbols making it ideal for artificial intelligence work: Languages like English and French consist of symbols which we manipulate into lists.

We'll be using lists right from the start as they are the fundamental structure of Lisp but, before we look at lists we must first look at atoms. This is an atom:

```
ATOM
```

and so are these:

```
Apples
bananas
X
y
```

An atom is a string of characters beginning with a letter. However, you can also have numeric atoms consisting entirely of digits:

```
1
5378
89
```

Is this an atom?

```
(ATOM)
```

No, it's a list. You can tell it's a list because of the brackets – it's an atom enclosed within brackets. These are also lists:

```
(eggs and bacon)
(jim)
(Acorn Electron)
(1 2 3 4 5)
(Learning Lisp is easy)
```

So, a list consists of one or more atoms enclosed within brackets. Just to confuse matters, lists can also be made up of other lists or any combination of lists and atoms:

```
((Fred Jim) and Sheila)
```

The first member of this list is the list *(Fred Jim)* – you can tell it's a list because of the brackets, and this list is made up of the atoms *Fred* and *Jim*. The rest of the original list consists of the atoms *and* and *Sheila*.

This is a list made up entirely of lists:

```
((1 2) (3 4))
```

It has two members – the lists *(1 2)* and *(3 4)* which also have two members each – *1,2* and *3,4*.
Lists can be nested to any level:

```
(((cream) cakes) and ((ras
berry (flavoured jelly))))
```

The first item of this list is *((cream) cakes)* and this is made up of the list *(cream)* and the atom *cakes*. The list *(cream)* has one item, the atom *cream*.

Lists need not contain any items at all and () is a NULL

→

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From Page 29

or empty list and:

```
(() () ())
```

is a list with three items – the NULL lists (), () and ().

Lisp uses the function CAR to indicate the first item of a list so, the CAR of:

```
(eggs and bacon)
```

is the atom *eggs* and the CAR of:

```
((cheese on) toast)
```

is the list (*cheese on*) – because this is the first item of the list.

CAR is a built-in Lisp function which expects a list as its argument and which returns the first item in this list. You can probably guess what the result of this Lisp program is:

```
(CAR '(bacon butties))
```

it is of course, the atom *bacon*. CAR means "What is the first item of the following list?".

This is a Lisp S-Expression – a syntactically correct expression. In other words, if you type it in Lisp will understand what you mean, work out and print the result.

Try typing this in after the 'Evaluate:' Lisp prompt. Don't forget the tick or single quote in front of the list (*bacon butties*). This is vital as it instructs Lisp to take what follows literally, that is, the characters *bacon* and *butties*.

Can you work out the result of these S-Expressions?

```
(CAR '(Acorn Electron))
(CAR '((Fred and) Jim))
```

The first is the atom *Acorn* and the second is the list (*Fred and*). Try entering them into Lisp and check that these results are actually printed.

Lisp has a similar command to CAR called CDR and this removes the first item of the list like CAR but, gives you what's left. For instance, the CDR of:

```
(this is easy)
```

is the list (*is easy*) and the CDR of:

```
((lisp lists)(are fun))
```

is the list (*are fun*)

Try entering the following S-Expressions into Lisp and check that the result is as you would predict:

```
(CDR '(baked beans))
```

is the list (*beans*) and:

```
(CDR '((1)(2)(3)(4)))
```

is the list (*(2)(3)(4)*). Notice that CDR Always gives you a new list.

As you may have guessed, Lisp has a way of building lists. CONS is a function which takes two arguments – an atom and a list. It CONStructs a new list and makes the atom the first item. For instance:

```
(CONS 'jam '(and bread))
```

results in the list (*jam and bread*) and:

```
(CONS 'sugar '(butties
 (are nice) to eat))
```

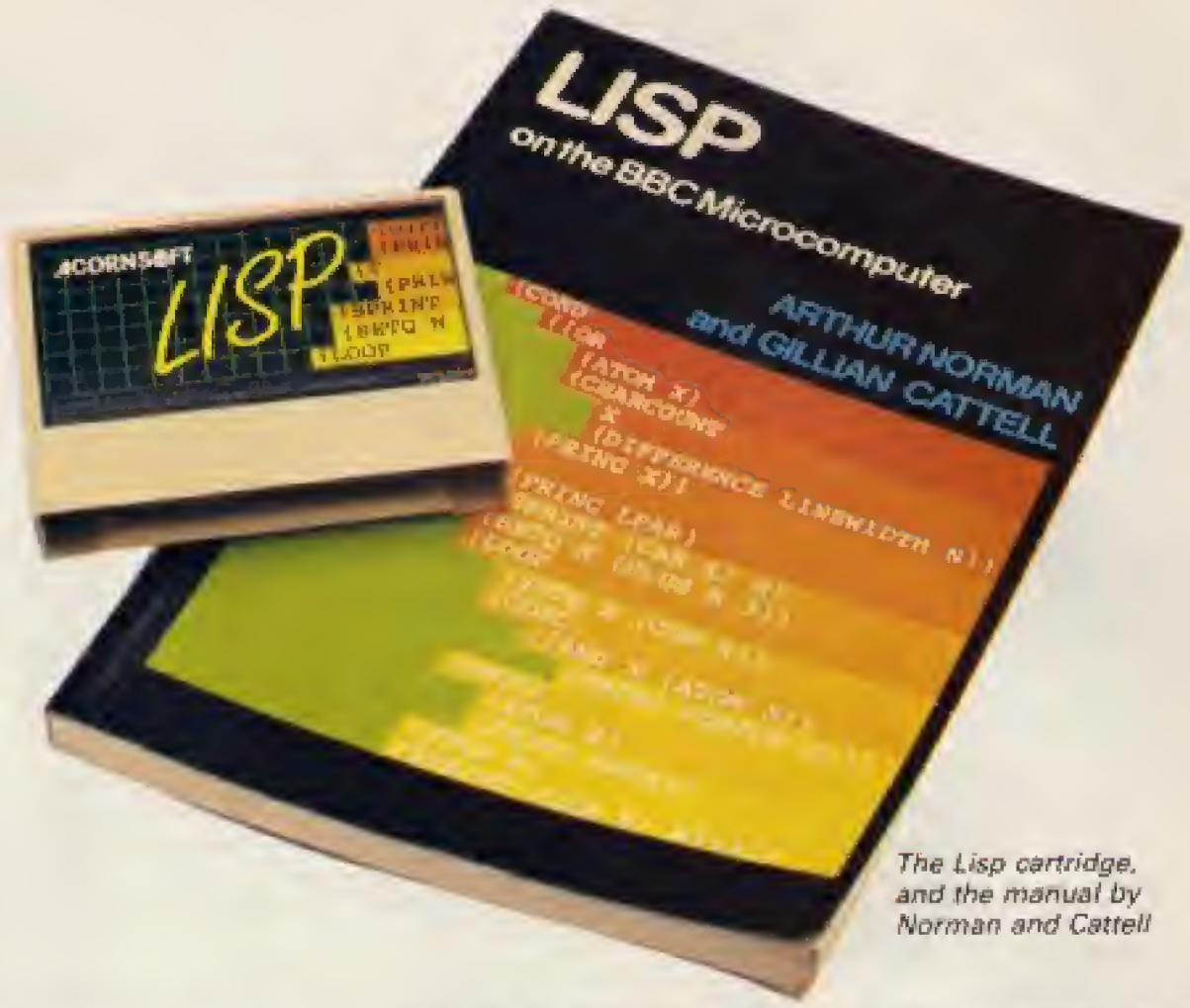
is the list (*sugar butties* (*are nice*) *to eat*).

Try CONStructing your own lists and work out the CAR and CDR parts. Don't forget the tick before all atoms and lists – this tells Lisp to accept what follows as literal and not to try to evaluate it. In other words:

```
'(fish and chips)
```

means simply (*fish and chips*)!

● *That's all for now. There is plenty here to keep you occupied till next month when we'll start defining our own variables.*



The Lisp cartridge, and the manual by Norman and Cattell

```
Acorn Electron
ACP 1770 DFS
LISP

Evaluate : (CAR '(baoon butties))
Value is : bacon
Evaluate : (CAR '((Fred and) Jim))
Value is : (Fred and)
Evaluate : (CDR '(baked beans))
Value is : (beans)
Evaluate : (CDR '((1)(2)(3)(4)))
Value is : ((2) (3) (4))
Evaluate : (CONS 'jam '(and bread))
Value is : (jam and bread)
Evaluate : _
```

Figure I: Using CAR, CDR and CONS

Help Harry serve

IN this educational program designed to improve your mental arithmetic you are cast in the role of an assistant on a busy greengrocer's stall.

After a hectic morning serving customers you are worn out and very hungry. It's five to twelve and nearly time for your lunch break.

Fortunately, your mother lives just around the corner from the stall so you ring her up and ask her to bring you something to eat.

Five minutes later your mother arrives with a large hamburger – just what you need to keep you going till tea. Unfortunately, there is a large queue of customers waiting to be served and you can't have your lunch break until they have been attended to.

So you must work as fast as possible and clear the queue before eating your hamburger.

The customers will pick their own vegetables or fruit and hand you their money. What you must do is take it and give them the correct change.

For instance, if Mrs Brown wants two bananas which are 10 pence each and she hands you 50p you must give her 30p change.

If you give them too little they'll be upset, but you'll have another chance to give the correct change. Be careful not to give too much – some dishonest customers may take the money without saying anything and the greengrocer will be very angry if he finds out, and you'll get the sack.

As your arithmetic improves the program becomes progressively harder.

The better you become the faster the customers will join the queue, and the higher levels will provide a challenging game.

VARIABLES

n%	Number of names.
n$()	Customers' names.
f$()	Names of the fruit.
p%()	Price of each fruit.
q%	Length of the queue.

PROCEDURES

assemble	Assembles the machine code.
error	Error trap.
big	Double height text.
tune	Plays the tune.
person	Draws a customer.

Full listing starts on Page 35

the hungry hordes!

By ANDREW and
STEPHEN WEIR

The most adventurous and original way to test your French ever devised.

FRENCH on the RUN!

The adventure game with a big difference.

£9.95 cassette

You're on your own in Occupied France — facing the toughest test that a British pilot has ever had to experience!

The year is 1943. As an RAF officer stranded in Occupied France you have one aim — to get back to Britain.

The only way to do this is to try to pass as a Frenchman, but if your French isn't good enough you risk capture and interrogation by the police or even the Gestapo.

Even the simplest tasks — from buying food to taking buses — place you at risk. And to add to your problems you've got limited funds: "Should I hitch a lift or take the train?", "Do I sell my belongings or get a job?"

Whatever you decide to do, time is short. And there are always people willing to denounce you . . .

French on the Run is that rare combination: A truly educational program that's also a thoroughly enjoyable game. This text adventure not only tests your grammar and vocabulary, but your knowledge of France and the French way of life.

And as your French improves the language problems get harder and the situations become progressively more dangerous. There are four routes to complete in sequence — you need the password from the last before attempting the next. The standard of French required is about O level, though on the last route it rises to just below A level.

And there's a chance for you to try out the French you'll learn in practice: We are offering a FREE WEEKEND IN PARIS as a prize to the first person to get back to England alive, having broken a code near the end of the final route.

For teachers: *French on the Run uses multi-choice questions with randomised distractors, all carefully chosen to illustrate linguistic points or points concerning things French. The program is meant for individual assessment, but can be used just as effectively for classroom work. A sealed envelope contains details of how the secret passwords are created.*

DATABASE SOFTWARE

TO ORDER TURN TO THE FORM ON PAGE 53

Hungry Harry listing

From Page 33

```
   10 REM Hungry Harry
   20 REM By Stephen and
   30 REM Andrew Weir
   40 REM (c) Electron User
   50 s$="£":s2$="p":*FX16
   60 n%=34:s%=4:dl=&5070:*FX4
,1
   70 ON ERROR PROCerror
   80 HIMEM=dl
   90 PROCassemble:d%=0:DIMn$(
n%-1),f%(s%),p%(s%):RESTORE120
:FORI%=0TOn%-1:READn$(I%):NEXT
:RESTORE140:FORI%=0TOs%-1:READ
f%(I%),p%(I%):IF s$="£" THEN p
%(I%)=p%(I%)/2
  100 NEXT:ENVELOPE1,1,-1,0,0,
50,0,0,126,0,0,-126,126,126:EN
VELOPE2,1,1,0,0,50,0,0,126,0,0
,-126,126,126:ENVELOPE3,2,-5,1
0,-5,3,3,3,126,0,0,-126,126,12
6
  110 *fx220,1
  120 DATAMiss Scarlet,Mr Brow
n,Ms Green,Mr Thin,Mrs White,D
r Clyde,Miss Hooper,Mr Granger
,Miss Woods,Dr Who,Mrs Price,M
r Horn,Miss Kent,Mr Moore,Mrs
Taylor,Mr Dixon,Ms Donalds,Mr
Daffy,Mrs Gasbie,Mr Giddens,Mr
s Gibb,Mr Thompson,Miss Manson
  130 DATADr Foster,Miss Frost
,Mr Hann,Mrs Young,Mr Borris,M
rs Falloon,Mr Franklin,Mrs Den
nis,Mr McDonald,Ms Magoo,Mr Cl
yde
  140 DATABanana,30,Apple,20,E
gg,25,Pie,80
  150 REM Tune
  160 DATA 100,3,80,2,68,1,52,
2,92,8,88,3,72,2,60,1,48,2,84,
2,80,6
  170 REM Main Program
  180 REPEAT MODE4:PROCinstruc
tions:MODE5:PROCplay:UNTIL 0
  190 END
  200 DEF PROCassemble oswrch=
&FFEE:osword=&FFF1:new=&70:row
s=&72:columns=&73:temp1=&74:FO
Rpass=0TO2STEP2:P%=&900:[OPTpa
ss
  210 .d STAb:LDA#10:LDX#b AND
255:LDY#b DIV256:JSRosword:LDA
#0:STAj:.d1 LDA#23:JSRoswrch:L
DAj:ORA#224:JSRoswrch:LDAj:ASL
A:ASLA:TAX:LDY#4:.d2 INX:LDAb,
X:JSRoswrch:JSRoswrch:DEY:BNEd
2:INCj:LDAj
  220 CMP#2:BNEd1:LDX#4:.d3 LD
As,X:JSRoswrch:DEX:BPLd3:RTS
  230 .person LDA&80:STAnew:LD
A&81:STAnew+1:LDA&82:STAnewdat
a+1:LDA&83:STAnewdata+2:LDX#6:
STXcolumns:LDY#48:STYrows:LDY#
0:JSRput:RTS
  240 .harry LDA#&58:STAnew:LD
A#&79:STAnew+1:LDA&82:STAnewda
ta+1:LDA&83:STAnewdata+2:LDX#6
:STXcolumns:LDY#48:STYrows:LDY
#0:JSRput:RTS
  250 .label LDA&80:STAnew:LDA
&81:STAnew+1:LDA&82:STAnewdata
+1:LDA&83:STAnewdata+2:LDX#6:S
TXcolumns:LDY#8:STYrows:LDY#0:
JSRput:RTS
  260 .put:.loop1:LDAnew+1:STA
```

```
temp1+1:LDAnew:STAtemp1:LDXrow
s:.loop2:.newdata LDA &3000,Y:
EORinew},Y:STA{new},Y:INCnewda
ta+1:BNEp3:INCnewdata+2:.p3 LD
Anew:AND #7:CMP#7:BEQbottom2
  270 INCnew:BNEp4:INCnew+1:.p
4 BNE next2
  280 .bottom2 CLC:LDAnew:ADC#
&39:STAnew:LDAnew+1:ADC#1:STAn
ew+1:.next2:DEX:BNE loop2:LDAt
emp1:ADC#8:STAnew:LDAtemp1+1:A
DC#0:STAnew+1:DECcolumns:BNElo
op1:RTS
  290 .b:]:j=b*9:s=j+1:$s=CHR$
11+CHR$225+CHR$8+CHR$10+CHR$22
4:NEXT:ENDPROC
  300 ENDPROC
  310 DEF PROCerror VDU22,7,10
,10:REPORT:PRINT" at line ";ER
L:END
  320 DEFPROCbig(A$):FORCH%=1T
OLENA$:A%=ASC(MID$(A$,CH%,1):CA
LLd:NEXT:ENDPROC
  330 DEF PROCcen2(A$):PRINTTA
B((40-LENA$)DIV2);A$;:ENDPROC
  340 DEF PROCcen(A$,Y):PRINTT
AB((20-LENA$)DIV2,Y);A$;:ENDPR
OC
  350 DEF PROCwait(t) t2=TIME:
REPEAT UNTIL (TIME-t2) DIV10>=
t:ENDPROC
  360 DEF PROCinstructions VDU
23;8202;0;0;0;31,9,0:PROCbig("
H U N G R Y   H A R R Y")
  370 PRINT""      Harry is a
 shop assistant.  His""job i
s to give each customer the co
rect""amount of change from
the money each""gives him.
It is your job to help him.""
  380 PRINT"      At the end of
 the queue, Harry's""mother
has his lunch.  The only way"
"Harry can get his lunch is t
o attend to""each customer."
"
  390 PRINT"      The queue get
s larger as you work""so you
 had better hurry up!""
 To turn the sound on and off,
""press 0 for Quiet or S for
 Sound now..."
  400 PRINTTAB(10,31)"Thinking
...";:IF NOT d% RESTORE1010:by
te=0:PROCdata(dl):d%=-1
  410 PRINTTAB(10,31)"Press ";
:COLOUR129:COLOUR0:PRINT"SPACE
";:COLOUR128:COLOUR1:PRINT" to
 play";
  420 REPEAT K=GET:IF K=ASC"S"
OR K=ASC"s" THEN *fx210,0
  430 IF K=ASC"Q"OR K=ASC"q" TH
EN *fx210,1
  440 UNTILK=32:ENDPROC
  450 DEF PROCplay VDU23;8202;
0;0;0;:PROCbench:REPEAT PROCve
rs:REPEAT PROCprint:PROCquesti
on:UNTIL q%=0 OR r%=1:UNTIL l%
=6 OR r%=1:IF l%=6 PROCcongrat
s
  460 ENDPROC
  470 DEF PROCbench VDU19,1,0;
0;:GCOL0,1:MOVE160,24:DRAW1050
,24:MOVE0,958:DRAW1280,958:COL
OUR2:PRINTTAB(4,0);:PROCbig("H
UNGRY HARRY"):l%=1
  480 !&82=dl+&120*(s%+1):CALL
harry
  490 !&80=&5800:!&82=dl+&120*
(s%+1)+240:CALL label:!&80=&59
00:!&82=dl+&120*(s%+1)+240+40:
CALL label
  500 ENDPROC
  510 DEF PROCqueue(q1%,f1%) q
1%=q1%-1:COLOUR1:IFq1%>3q1%=3
  520 q2%=0:IFq1%>-1 THEN FORq
2%=0 TO q1%:PROCperson(f1%MODs
%,q2%):f1%=f1%+1:NEXT
  530 IF q2%<=3 PROCperson(s%,
q2%)
  540 ENDPROC
  550 DEF PROCperson(t%,x%) x2
%=(3-x%)*&30+&7768
  560 !&80=x2%:!&82=dl+t%*288:
CALLperson:ENDPROC
  570 DEF PROCvars q%=10:f%=RN
D(n%)-1:PROCqueue(q%,f%):ENDPR
OC
  580 DEF PROCquestion PROCwip
e:nu%=RND(1%):IFnu%=0nu%=1
  590 q$=n$(f%)+" wants "+STR$
nu%+" "+f$(f%MODs%):IF nu%>1
 w$=w$+"s"
  600 COLOUR3:PROCcen(q$,4):PR
OCcen(w$,6)
  610 COLOUR2:PROCcen("I "+f$(
f%MODs%)+" coss "+FNmon(p%(f%
MODs%)),9)
  620 REPEAT IFnu%*p%(f%MODs%)
<100 g%=RND(10)*10 ELSE g%=RND
(l%+1)*100
  630 UNTIL g%>nu%*p%(f%MODs%)
:COLOUR3:IFf%DIV2=f%/2 THEN g$
="She " ELSE g$="He "
  640 g$=g$+"gives you "+FNmon
(g%):COLOUR3:PROCcen(g$,12)
  650 COLOUR1:PROCcen("How muc
h change do",15):IFf%DIV2=f%/2
 THEN g$="her?" ELSE g$="him?"
  660 PROCcen("you give "+g$,1
7):TIME=0:REPEAT
  670 a$="";REPEAT COLOUR3
  680 K=INKEY(1):IF K=ASCs$ORK
=ASCs2$ORK=ASC"."OR(K>=ASC"0"A
NDK<=ASC"9") OR (ASCs2$=K+32 A
ND K<=ASC"Z") THEN a$=a$+CHR$K
 ELSE IF K=127 THEN a$=LEFT$(a
$,LENa$-1) ELSE IFK>0 ANDK<>13
 SOUND1,-7,50,2
  690 IFRIGHT$(a$,1)=CHR$(ASCa
2$-32) THEN a$=LEFT$(a$,LENa$-
1)+s2$
  700 PRINTTAB(5,20);:IF LEFT$
(a$,1)<>s$ PROCbig(" "+a$+" "
) ELSE PROCbig(a$+"  ")
  710 a%=0:IF TIME>RND(2000)+2
000 a%=-1:IF q%<=4 THEN IF q%<
n% PROCqueue(q%,f%):PROCqueue(
q%+1,f%)
  720 IF a% THEN TIME=0:SOUND0
,-10,4,2:IF q%<n% q%=q%+1
  730 IF a% THEN PROCprint
  740 UNTIL K=13:IFLEFT$(a$,1)
=s$ THEN a$=RIGHT$(a$,LENa$-1)
:z%=-1 ELSE z%=0
  750 IFRIGHT$(a$,1)=s2$ THEN
a$=LEFT$(a$,LENa$-1)
  760 i%=INSTR(a$,","):a%=VAL(
MID$(a$,i%+1,LENa$)):IF i%>0 a
%=a%+VAL(LEFT$(a$,i%-1))+100 E
LSE IF z% a%=a%+VALa$*100
  770 a%=a%+nu%*p%(f%MODs%)
  780 IF a%=g% r%=0 ELSE IF a%
<g% r%=-1 ELSE r%=1
  790 IF r%=0 z$="satisfied"
  800 IF r%=1 AND (a%-g%<=20 O
R (a%-g%<=200 AND RND(10)>=5))
 THEN z$="dishonest":z%=0
  810 COLOUR3:IF r%<1 PROCcen(
n$(f%),20):PRINTTAB(0,21);SPC2
0
  820 IF r%=-1 PROCcen("is ver
y angry!",22):SOUND1,1,50,10:P
ROCwait(20):PRINTTAB(0,20);SPC
60
  830 IF r%=0 PROCcen("is "+z$
,22):SOUND1,2,50,10:PROCwait(2
0):PROCqueue(q%,f%):q%=q%-1:f%
=f%+1:If f%>n%-1 f%=0
  840 IF r%=0 PROCqueue(q%,f%)
:IF q%=0 PROCprint:l%=l%+1:PRO
Cup
  850 IF r%=1 PROCwipe:SOUND1,
3,150,60:COLOUR1:PROCcen("Harr
y's boss",5):PROCcen("FIRES HI
M!",7):COLOUR2:PROCcen("You ga
ve",10):COLOUR3:PROCcen(n$(f%)
,12):COLOUR2:PROCcen("too much
 change!",14):PROCwait(50)
  860 UNTILr%>-1:ENDPROC
  870 DEF FNmon(j%) IF j%>=100
 THEN m$=s$+STR$(j% DIV100)+",
" ELSE m$=""
  880 m$=m$+STRING$(2-LEN(STR$
(j% MOD100)),"0")+STR$(j% MOD1
00):s2$:=m$
  890 DEF PROCprint COLOUR1:PR
INTTAB(0,1);STRING$(2-LEN(STR$
q%)," ");STR$q%;TAB(18,1);STR$
f%:ENDPROC
  900 DEF PROCwipe VDU28,0,22,
19,4,12,26:ENDPROC
  910 DEF PROCup PROCwipe:COLO
UR3:PRINTTAB(8,5);:PROCbig("Ha
rry");PRINTTAB(6,9);:PROCbig("
enjoys his"):PRINTTAB(6,13);:P
ROCbig("hamburger!");PROCtune
  920 PROCqueue(0,0):COLOUR2:P
```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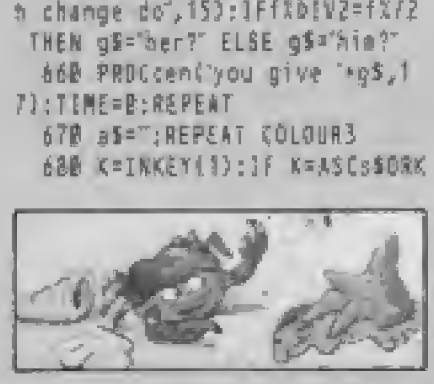

→

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```
RINTTAB(8,20);:PROCbig("YUM!")
:PROCwait(20):ENDPROC
  930 DEF PROCcongrats PROCwip
e:COLOUR2:PRINTTAB(2,5);:PROCb
ig("CONGRATULATIONS!"):COLOUR3
:PRINTTAB(5,9);"You have";TAB(
5,12);"completed":COLOUR1:PRIN
TTAB(2,16);:PROCbig("all five
levels!"):PROCtune:PROCwait(20
):ENDPROC
  940 DEF PROCtune RESTORE160:
FOR I=1TO11:READpi,du:SOUND1,-1
0,pi+10,du*4:NEXT:ENDPROC
  950 END
  960 DEF PROCdata(add) REPEAT
 READdata:IF data>=0 PROCprint
2(data):UNTIL 0
  970 IFdata=-1 READnumber,dat
a:FOR I%=1 TO number:PROCprint
2(data):NEXT
  980 UNTIL data<-1:ENDPROC
  990 DEF PROCprint2(nu%) add?
byte=nu%:byte=byte+1:ENDPROC
 1000 REM Banana
 1010 DATA -1,50,0,16,48,48,11
2,112,-1,6,240,112,113,17,19,-
1,11,3,10,33,18,37,82,37,82,16
5,-1,8,17,-1,4,16,0,224,240,22
6,226,230,196,247,238,136,238,
204,-1,5,136,76,110,110,127,63
,63,12,12,-1,4,8,132,72
 1020 DATA 132,74,164,74,165,-
1,8,136,128,192,224,96,-1,17,0
,34,17,17,17,136,238,255,-1,44
,0,128,240,240,248,-1,42,0,16,
48,240,224,192,-1,25,0
 1030 REM Apple
 1040 DATA -1,21,0,1,2,5,-1,4,
7,3,-1,26,0,1,3,7,7,63,63,116,
118,51,51,17,17,17,3,60,96,104
,120,120,105,30,-1,5,112,49,34
,17,34,-1,4,17,1,16,1,16,1,16,
16,-1,7,0,14,15,14,15,238,170,
187,238,204,238,204,136
 1050 DATA 136,0,192,224,241,1
13,128,14,-1,5,224,192,68,136,
68,136,68,136,136,136,8,128,8,
128,8,192,224,-1,7,0,1,16,1,-1
,5,0,1,16,1,16,1,16,0,0,255,25
5,-1,31,0,72,134,44,23,34,34,8
8,165,90,165,90,165,90,165
 1060 DATA 90,37,136,-1,32,0,6
8,136,0,0,128,72,164,74,164,74
,164,74,132,72,128,-1,24,0
 1070 REM Egg
 1080 DATA -1,56,0,-1,7,15,7,7
,19,17,34,85,34,85,34,85,34,85
,34,85,34,85,34,85,34,85,34,85
,170,85,170,85,170,119,48,48,1
8,3,3,-1,9,0,0,12,12,204,102,2
04,136,204,136,136,136,68,170,
85,170,85,136,68,136,68
 1090 DATA 136,68,170,68,170,6
8,170,68,170,68,170,68,170,204
,0,0,0,8,12,-1,22,0,85,170,85,
-1,35,0,17,17,17,51,51,49,51,5
0,49,16,113,232,-1,35,0,136,20
4,204,204,-1,5,238,238,200,196
,-1,25,0
 1100 REM Pie
 1110 DATA -1,50,0,16,48,48,11
2,-1,5,51,-1,5,17,-1,17,3,-1,1
1,1,-1,4,16,0,151,211,224,224,
240,170,255,238,136,238,238,20
4,136,136,136,12,12,14,15,7,7,
11,13,-1,9,14,12,-1,10,14,104,
240,240,112,-1,20,0,24,14
 1120 DATA 31,31,15,7,3,-1,38,
0,1,51,255,240,240,248,248,204
,-1,41,0,136,238,240,224,224,1
92,-1,24,0
 1130 REM Lunch
 1140 DATA 0,0,17,16,0,0,18,37
,74,148,8,128,0,51,68,187,71,1
73,143,14,45,15,67,37,3,128,22
4,112,16,204,31,90,37,16,0,16,
17,0,0,96,112,48,-1,6,0,49,250
,245,250,0,37,90,165,0,240,240
,51,119,204,139,30,15,165
 1150 DATA 15,0,165,15,195,30,
165,14,3,0,224,192,136,127,165
,90,0,250,245,250,49,0,240,240
,3,51,119,119,119,51,245,250,2
45,250,16,165,90,132,0,112,48,
204,255,0,15,12,75,3,30,15,11,
30,15,90,14,3,150,0,112
 1160 DATA 112,220,123,165,90,
164,250,245,250,245,0,240,240,
0,0,136,136,136,0,245,250,245,
250,24,165,90,0,0,0,200,144,68,
187,0,15,11,150,15,44,15,9,15,9
0,15,6,41,15,0,128,200,224,0,1
65,90,0,250,245,250,245
 1170 DATA 0,240,240,-1,6,0,19
6,250,245,250,8,165,90,0,16,22
4,192,51,204,34,29,75,30,72,7,
75,75,12,15,90,5,15,132,16,96,
192,17,220,165,90,1,250,245,25
0,220,0,240,240,6,102,255,255,
255,102,0,0,128,136,0,0
 1180 DATA 74,36,18,164,208,1,
204,34,170,119,29,91,31,33,15,
30,74,14,12,0,0,240,192,85,33,
74,165,74,8,200,196,136,0,48,2
40,224,-1,6,0
 1190 REM Harry at the counter
 1200 DATA -1,16,0,54,51,-1,30
,0,255,255,-1,20,51,119,255,-1
,13,0,67,195,0,255,255,255,238
,238,238,-1,4,204,-1,8,136,-1,
5,0,136,0,16,0,0,0,17,-1,7,0,1
5,15,0,204,137,-1,7,1,-1,13,0,
1,1,0,240,240,240,101,222
 1210 DATA 255,255,119,255,119
,102,38,-1,13,15,0,-1,4,15,102
,102,102,96,96,96,14,14,10,8,1
28,-1,4,192,204,136,136,-1,31,
0
 1220 REM Queue
 1230 DATA 102,-1,4,153,221,10
2,17,0,0,-1,4,85,51,0,0,0,34,8
5,119,68,51,0,0,0,-1,4,85,51,0
,0,0,34,85,119,68,51,-1,9,0
 1240 REM Level
 1250 DATA -1,8,0,-1,6,34,51,0
,0,0,17,34,51,34,153,0,0,0,34,
170,170,17,153,0,0,0,153,170,1
87,34,17,0,34,34,34,170,170,34
,187,0,-9
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

Keep your memories fresh

ROLAND WADDILOVE finds that there is something that's better than sideways ram

FOR some time now Advanced Computer Products has had a sideways ram cartridge on the market and it has proved an extremely useful addition to my Electron/Plus 3/Plus 1 system. In fact I didn't think I could manage without it.

But it has now been relegated to the bottom draw of my desk and is no longer used. It's place has been taken by ACP's latest product – Advanced Battery Backed Ram (ABBR).

An enhanced version of the original ram cartridge, it now sports 32k of ram in two 16k blocks – and is battery backed to boot.

One of the bugbears of ordinary sideways ram is that when you switch off the micro you lose everything stored there. The battery in the ABBR cartridge ensures that what you place in the ram stays there permanently. Well, that's not quite true – it stays there until you overwrite it with something else.

The battery is rechargeable and automatically charges itself up whenever you're using the micro, so it's always in tip top condition.

The cartridge also comes with a set of utilities to enable you to use the ram as a printer buffer and load, save and create your own roms. These utilities are the same as those found in ACP's Advanced Rom Manager reviewed in the December 1986 issue of *Electron User*.

ROMLOAD and ROMSAVE load and save rom images, APB uses one 16k block to extend the Electron's printer buffer, MAKEROM will create a rom from one or more Basic or machine code programs and LOCK and UNLOCK set the write protect switch – some roms are protected and try to write to themselves, corrupting the code.

A word of warning here: The utilities are stored in the sideways ram cartridge and they must be saved before you use it. This isn't made quite clear enough in the accompanying manual and unfortunately if you load a rom you'll wipe them out. So, save them first.

If you're not sure exactly what you can and can't do with sideways ram take a look at the February 1986 issue of *Electron User* where you'll find a four page feature dealing with this subject.

One of the most common problems experienced by Plus 1 owners is a lack of cartridge sockets. Many Electron owners have upgraded to discs and have either the Cumana or Plus 4 disc interfaces. These plug into one of the Plus 1's cartridge sockets leaving only one free.

This makes it very awkward if you regularly use two cartridges, say View and Viewsheet. To go from one to the other you have to to switch off the Electron, unplug one cartridge, plug the other in and switch back on.

However, there is a way round the problem. You can plug in a cartridge, store the rom on disc using a utility and then unplug it. Now if you load the rom image into sideways ram the Electron thinks you've plugged the cartridge back in.

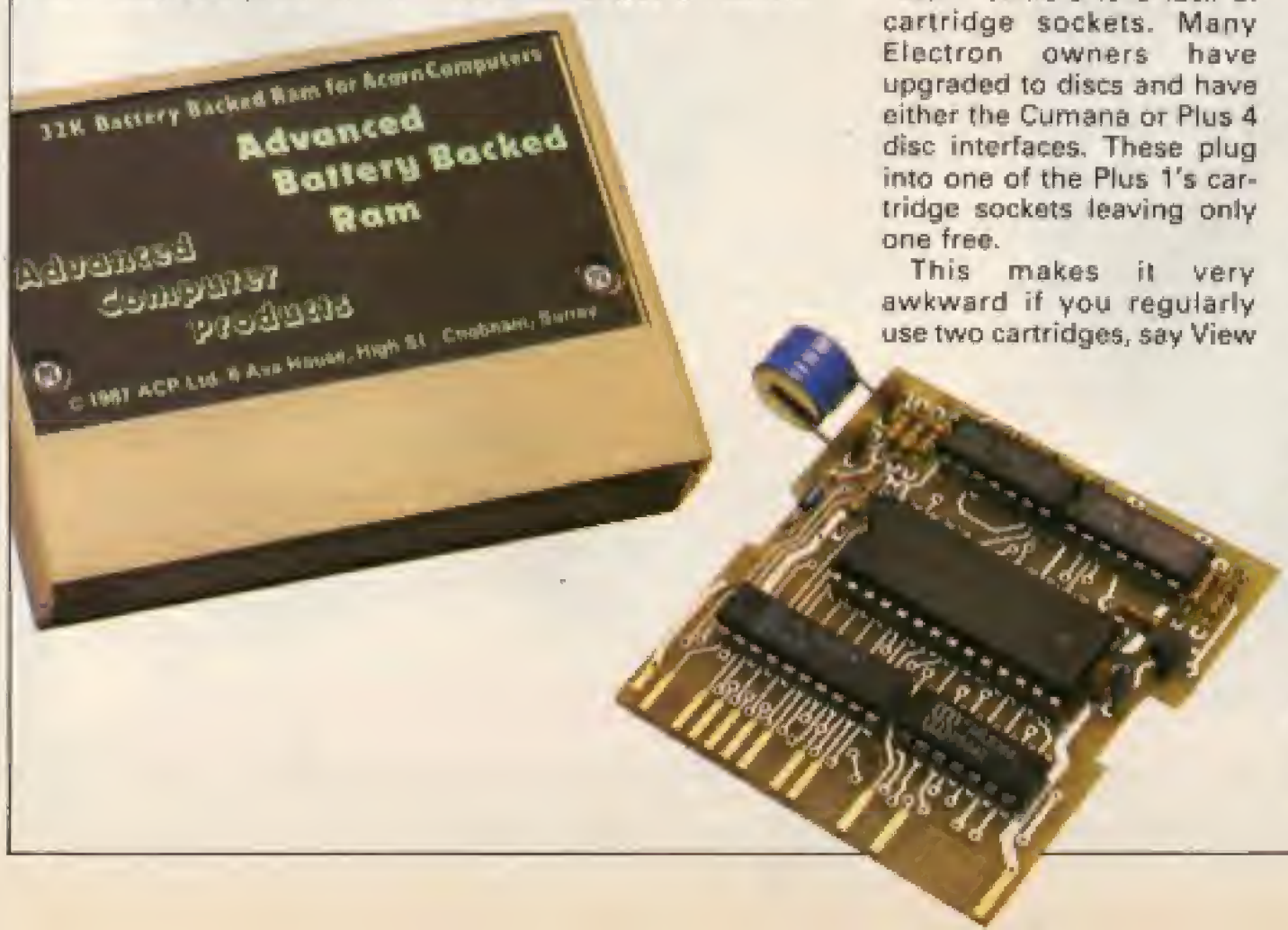
ABBR contains 32k of ram and you can load one rom into the first 16k block of ram and another into the second 16k. The Electron will think that you've got three cartridge slots – two in one.

What is more, the battery ensures that the information you store there stays put when you switch off, so it's like having two cartridges permanently plugged into one socket.

I must emphasize that the ram is not part of the main memory map and can't be used for programs. It occupies the same address space as a rom, that is, &8000 to &BFFF and can only be used as a rom, printer buffer or ram disc.

Machine code programmers will find many uses for sideways ram as it is easily accessed from machine code. You can use it to store data used by programs, text for word processors, utilities and graphics screens.

Sideways ram is essential for writing your own rom software and it's not as difficult as you might think. To give an example of what can



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From Page 37

be achieved with just a few lines of code take a look at the listing accompanying this review.

Run this program to create and store a rom image on disc. Now load it into sideways ram with ASR or ROMLOAD (two utilities provided by ACP with their ram cartridges) and a !Boot rom is created.

Now whenever you switch on your Electron the disc drive will start up and wait for you to insert a disc. Place one in the drive and your micro will automatically *EXEC the !Boot file.

This file can be used to configure the Electron, setting the colours, keyboard repeat rate, mode and so on, CHAIN a menu, load a rom into sideways ram or simply run your favourite game – it's up to you.

You may find when writing your own rom software that your micro will lock up if you make an error or typing slip in the machine code. Since the ram is battery backed it isn't wiped when you switch off your Electron, so the micro will lock up every time you switch on.

However, the solution is quite simple: Switch off, unplug the cartridge, switch on and plug it back in with the power on. This won't damage it, but the contents of the ram will be ignored by the Electron. Now you can correct the error by overwriting the contents.

Finally, an added bonus is that you can use the cartridge in a BBC Master, so if you have friends with Masters or if you intend upgrading at any time simply unplug the cartridge from your Electron and plug it into the Master.

The contents of the ram will be preserved thanks to the battery.

To sum up then: It's a superb add-on and an absolute must for all serious Electron users. There's only one thing better than sideways ram – and that's battery backed sideways ram! ■

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```
   10 REM !BOOT ROM
   20 REM By R.A.Waddilove
   30 REM (c) Electron User
   40 PRINT"ADFS or DFS?"
   50 IF (GET OR 32)=ASC"a" bo
ot$="KEY0 *MOUNT|M*EXEC !Boot
|M" ELSE boot$="KEY0 *EXEC !Boo
t|M"
   60 osbyte=&FFF4:oscli=&FFF7
   70 FOR pass=4 TO 6 STEP 2
   80 P%=&8000:O%=&900
   90 [OPT pass
  100
  110 .rom
  120 EQUW 0:EQUB 0
  130 JMP service
  140 EQUB &82
  150 EQUB (copyright-rom)
  160 EQUB 0
  170 .title EQUS "Boot ROM"
  180 EQUB 0
  190 EQUS "1.00 "
  200 .copyright EQUB 0
  210 EQUS "(C) Electron User"
  220 EQUB 0
  230
  240 .service
  250 PHP
  260 CMP #2:BNE end
  270 PHA:TXA:PHA:TYA:PHA
  280 LDX #key MOD256
  290 LDY #key DIV256
  300 JSR oscli
  310 LDA #138:LDX #0:LDY #128
  320 JSR osbyte
  330 PLA:TAY:PLA:TAX:PLA
  340 .end
  350 PLP
  360 RTS
  370
  380 .key EQUS boot$+CHR$13
  390 ]
  400 NEXT
  410 *SAVE BootROM 900 +68 FF
FF8000 FFFF8000
```


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Going round in circles

AFTER last month, FOR . . . NEXT loops should cause you no difficulties. As you'll remember they take the form:

```
FOR control variable = start TO finish
body of loop
NEXT control variable
```

The control variable is a numeric variable that takes values ranging from *start* to *finish*. Initially having the value *start* this control variable is automatically increased by one for each cycle through the loop. This continues until the value held in the control variable exceeds the value in *finish*.

For each cycle of the loop the Electron performs the body of the loop, the Basic statements sandwiched between the FOR and its corresponding NEXT. In case that seems complicated, have a look at Program I which shows a FOR...NEXT loop in action.

```
10 REM Program I
20 total=0
30 FOR loop=1 TO 5
40 INPUT "Give me a number " number
50 total=total+number
60 NEXT loop
70 PRINT "The total is ";total
```

Here the loop control variable is the aptly named *loop*. This is to take values from 1 to 5, starting at 1 and going up in ones to 5. Each time the loop cycles lines 40 and 50, the body of the loop, are performed. Only when *loop* is 6 does the program drop out of the loop and go on to the statement after the NEXT.

The result of this is that five numbers are given to the program which obligingly prints their total. Try doing this without the FOR . . . NEXT loop and you'll see how useful a construction it is.

FOR . . . NEXTs for a change

IF you think that Program II is almost exactly the same as Program I, full marks! It is, apart from the REM and one number in line 30.

Yet, for all the similarity, the actual job the program does has changed vastly. Instead of asking for and giving the sum of five numbers as before, it now requests eight. This is because we've changed the range of the control variable, *loop*. If you look at line 30 you'll see that the finish value of *loop* is set to 8. Hence the eight cycles of the loop.

```
10 REM Program II
20 total=0
30 FOR loop=1 TO 8
40 INPUT "Give me a number " number
50 total=total+number
60 NEXT loop
70 PRINT "The total is ";total
```

Notice how flexible this makes things. It would be just as easy to add 50 or 100 numbers by changing line 30 to:

```
30 FOR Loop=1 TO 50
30 FOR Loop=1 TO 100
```

It's such a simple change but look at the effect on the program.

It also makes producing our lines of asterisks much easier. Try deleting lines 40 and 50 and add lines:

```
45 PRINT "*";
70 PRINT
```

You'll find that now it's simplicity itself to produce a line of asterisks as long as you like. (Well almost. What's the limit? Try it and see.)

From this you should see that using FOR...NEXT loops gives us a powerful yet flexible way of getting our programs to perform a task over and over again.

FOR shortening

IN essence, Program III isn't all that different from our previous programs. Obviously the loop control variable is called *counter* and it only takes values from 1 to 3. The loop will cycle three times and the code inside it now does a multiplication instead of an addition. Because of this *total* now starts off with the value 1 instead of 0 as before.

```
10 REM Program III
20 total=1
30 FOR counter=1 TO 3
40 INPUT "Give me a number " number
50 total=total*number
60 NEXT
70 PRINT "The result is ";total
```

There's one other alteration that keen-eyed readers may have spotted. Look at the NEXT of line 60. That's all there is, a NEXT. There's no control variable with it. Beforehand whenever we've had a NEXT, there's been a control variable next to it. Hence a loop controlled by *loop* had its end marked by:

```
NEXT loop
```

One governed by *control* had the limit of the body of the loop shown by:

```
NEXT control
```

Yet in Program III it isn't there and the program works perfectly well without it.

This is as it should be. You don't have to put the control variable next to the NEXT. However, I'd advise you to put it there. It makes life much easier when we get to things likcd nested loops. You might save yourself a bit of typing by leaving it out but it's not really worth it.

You can also save time at the keyboard by using abbreviations instead of Basic keywords. For example the NEXT of line 60 could be reduced to N. and P. can replace PRINT. While this can save time, for the moment I'd advise you to stick to the full keywords. A little time spent on extra typing can save a lot of time figuring out what's happened when things go wrong.

Loop inside the loop

A GLANCE at Program IV shows that it holds no real surprises. The FOR...NEXT loop that drives the program cycles 5 times and is controlled by the variable *loop*. A numeric variable *total* is used to keep a running total. So far so good.

```
10 REM Program IV
20 total=0
30 FOR loop=1 TO 5
40 total=total+loop
50 NEXT loop
60 PRINT "The total is ";total
```

But what is the program totalling? It doesn't request any numbers as before.

A look at the body of the loop, line 40, shows that each time round the loop, *loop* is added to *total*. In other words, the current value of the loop control variable for that cycle of the loop is added to the running total.

We haven't come across this method of using the control variable inside the loop before. Employing it we can get the micro to do all sorts of calculations. In the above case the FOR . . . NEXT loop added the numbers from 1 to 5. it could just as easily add from 1 to 50 or 1 to 100. All it needs is a little change to the final value for *loop* prescribed in line 30.

You can even get FOR . . . NEXT loops to do your "times tables". Just get rid of line 60 and add the lines:

```
30 FOR loop=1 TO 12
40 PRINT loop*2
```

for the "two times" table.

The start and finish

ALL our FOR...NEXT loops so far have had 1 as the start value of the loop control variable. This doesn't have to be the case as you'll see if you look at Program V.

```
10 REM Program V
20 FOR loop=2 TO 7
30 PRINT loop
40 NEXT loop
```

Here the control variable *loop* is told to start with the value 2. It's then incremented by 1 for each cycle of the loop which just prints out the value of *loop*. The program stops when *loop* attains the value 8.

Can you tell how many times the loop will cycle just by looking at line 20? Run the program and see if you're right, then try other lines such as:

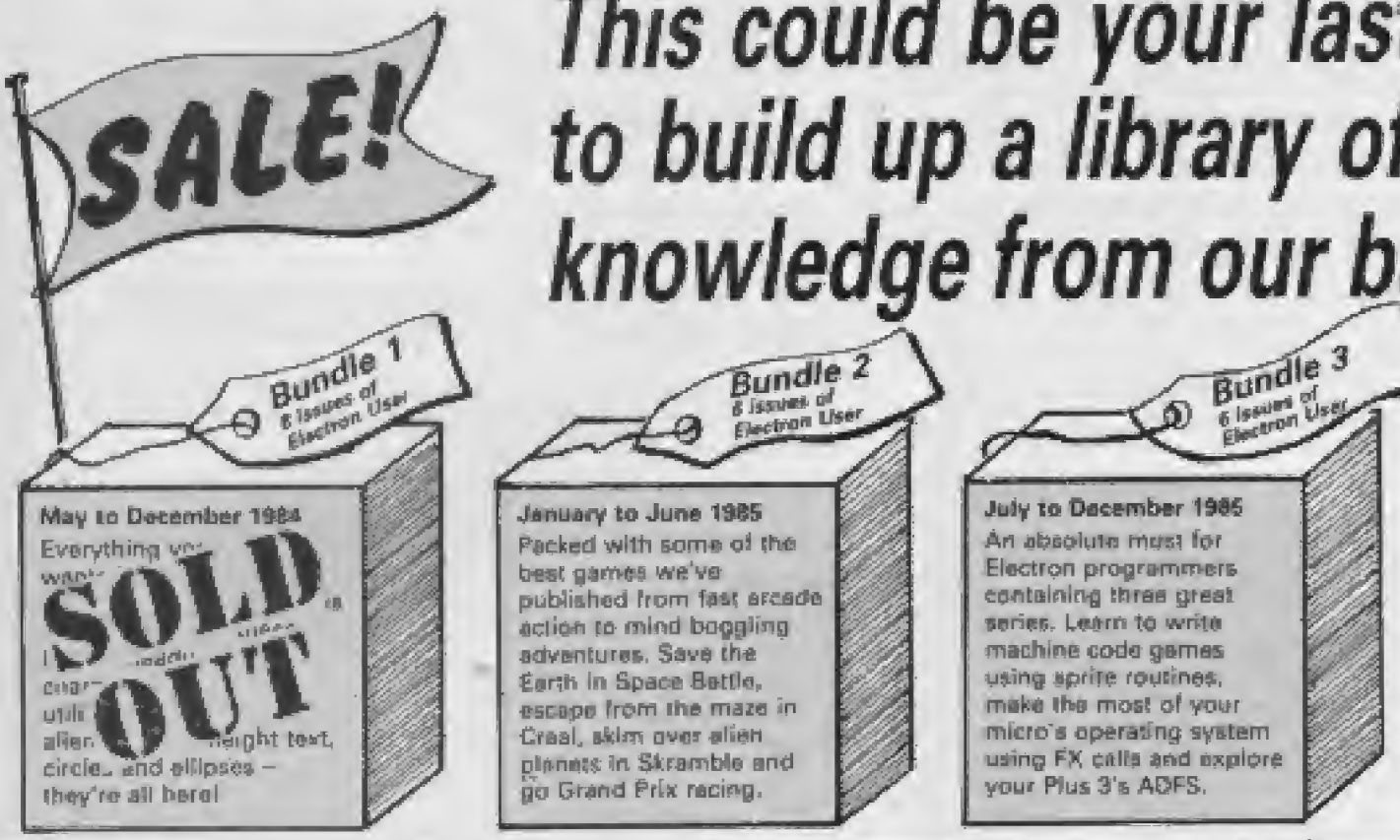
```
20 FOR loop=0 TO 3
```

or

```
20 FOR loop=-3 TO 5
```

and see what happens. And that's all for this time. We'll go over more loops next month.

This could be your last chance to build up a library of fun and knowledge from our back issues!



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February 1987

MAZE Escape from the creepy castle. **KEYBOARD PLAYER** Turn your micro into an electronic organ. **TOMMY** Guide little Tommy through the woods. **CARPET** An impressive graphics display. **GCOL** Experiment with extra colours. **10 LINERS** Two short but impressive listings.

January 1987

GRID WARRIOR Battle with alien gladiators deep in space. **MODE 7** A Mode 7 simulator providing teletext graphics. **SMILEY HUNT** The final version of Al's scintilating magagame. **10 LINERS** Zap the alien intruder and dodge the asteroids. **LISTER** A utility to enable you to list programs directly from disc or tape.

December 1986

SANTA'S SLEIGH Help Father Christmas fill his sleigh with presents in this fast arcade game. **YULE SPELL** Spelling can be fun with this seasonal variation on the old favourite hangman. **POGO** A Logo turtle graphics compiler. **FUNCTION KEY LISTER** Keep track of your function key definitions with this helpful utility. **10 LINERS** Two short but impressive graphics demonstrations.

November 1986

TRAIN TROUBLE You've just robbed a bank. Can you escape the forces of law and order in this chase over the carriages of a fast moving express? **DAY AT THE RACES** You can gamble away to your heart's content in safety with our entertaining two player horse racing game. **BASIC COMPILER** This superb utility will turn your Basic programs to machine code in no time at all. **10 LINERS** A routine from our fascinating series of short programs.

October 1986

RAT CATCHER Try your hand at pest control with this fast action arcade game. **MATHS RUN** Put your powers of mental arithmetic to the test with this educational program. **BOS** This on screen editor will take the tedium out of debugging listings and sort out your typing slips. **CROSSWORD** Two programs for crossword lovers – one to design crosswords and the other to help you solve them. *+ **BONUS game:*** **QUASIMODO'S QUEST** Rescue Esmerelda in this colourful version of the all time favourite.

September 1986

CAVERN CAPERS Blast your way from the depths of the labyrinth to escape from the planet. **DRAW WRITER** A superb utility to translate your on screen graphics to the procedures to create them. **COMPANY COUNT** Work your way up the company pecking order in this educational maths test. **TEN LINERS** Another short but fascinating program. *+ **BONUS game:*** **ROCKFALL** Go diamond mining in this intriguing multi-screen arcade romp.

August 1986

HOWZAT! A vivid recreation of a day's test cricket for two players. **3D MAZE** Quick reactions and a sense of direction are needed to escape from our twisty maze. **TEXTED** Let this versatile text editor turn your micro into an electronic typewriter. **DRIVER** A powerful printer driver for View.

July 1986

ROYAL WEDDING Celebrate the royal event with our ingenious sliding block puzzle. **SNAPDRAGON** Two player version of the classic card game. **ATTRIBUTES** Colourful two player strategy game. **FORMATTER** Make your listings easier to read. **DISCS** Extended star commands. **EXTRA COMMANDS** A WHILE . . . WEND command for your micro. **PLUS** superb digitised picture of Andrew and Sarah.

June 1986

FISHING Enjoy a quite day by the river, and maybe catch your tea as well! **TACTICAL PURSUIT** A two player strategy game played with pawns on a chess board. **MINIBASE** Create an electronic telephone directory. **EXTRA COMMANDS** Add more commands to Basic. **SCREEN DUMP** Multi-tone screens dumps for Epson compatible printers.

May 1986

MISSILE JAMMER Defend the city of Pezina from a missile invasion. **VECTOR LETTERS** Use *LINE to create double height text. **DEGREES** Convert from Centigrade to Fahrenheit and vice-versa. **CROCODILE TEARS** Spell well or end up as a crocodile's dinner. **ZAP** Blast the marauding aliens. **EXTRA COMMANDS** Adding new keywords to Basic.

To order, use the form on Page 53

Figure 1: The game in progress

Have a little Patience..

By PAUL HODGKINSON

THIS is an Electron version of that classic card game Patience. Converting it to run on a micro doesn't make it any easier, and it is just as frustrating as it's always been.

Most of you will already be quite familiar with the rules, but there are several variations, so here is a brief outline of this version.

When you run the program you will see seven columns of cards labelled A to G. These are face down except for the bottom ones.

Additionally there are four stacks, initially empty, and a pile of cards below them. The pile is face down except for the top card.

The aim is to finish with four columns of cards, each alternating between black and red, from a king at the top down to an ace.

A card or run of face-up cards can be moved from one column to another providing that the destination card is of the opposite colour and one higher.

For instance, you could put the five of spades on the six of diamonds or the queen of hearts on the king of clubs.

Figure 1 is a picture of a game in progress and shows what I mean.

If a column becomes empty you can place any card there, though it's best to lay the kings out first.

When a card or run is moved the top face-down card is turned over.

Any aces can be moved to the stack, followed by the twos, threes and so on of the same suit. They can be moved back to a column at any time.

Eventually you won't be able to make any more moves. In fact, sometimes you won't even be able to make one when you start.

In these circumstances you turn over the cards in the pile.

The top, face-up one can be placed on any of the columns, or the stack if it will go. If it won't, continue turning over the cards on the pile.

Hopefully you'll be able to transfer all the cards from the pile to the columns and arrange them in the required order.

If you are still unsure about what you can and can't do – experiment. The program is quite user-friendly and won't allow illegal moves.

If you hear a beep when making a move it means that it isn't allowed.

The columns are labelled A to G, the pile is P and the stack is S. To move a card from one place to another press the source letter followed by the destination.

For instance, to move a card from the pile to column E, press P followed by E. And to see the next card on the pile press N.

There is one final command that you'll need to remember and that's Q to quit.

Use this when you're stuck and can't go any further. You then have the option to try again.

CONTROLS

N	Turn over the next card on the pile.
Q	End the game.
A-G	Select a column to move from or to.
S	Move a card from or to the stack.
P	Move a card from the pile.

PROCEDURES

rem	Move a card from a column.
next	Turn over the next card on the pile.
card	Draw a card.
setup	Shuffle the cards.
blank	Draw a blank card.
dbl	Print double-height text.
gtpl	Get a card from the pile.

Full listing starts on Page 45

XOR

The Ultimate Maze Challenge

There are no random events in XOR's labyrinthine palace, and there is no premium on hand-eye coordination. You have all the time in the world to work out the precise nature of the hazards you encounter. Logical thinking, strategy and tactical problem solving are all part of the XOR experience. And XOR is not simply about finding solutions. If you can solve the entire puzzle (15 levels plus an encrypted anagram), you qualify to be a member of the Order of XOR. With a certificate and a badge to prove it.

"...this is one of the most compulsive, cunning and attractive programs I've seen for some time! .... the game is superb - a very classy original twist on the basic maze theme" A+B Computing

XOR's Features

- 15 graded mindbending mazes - each maze approximately 16 screens
- super smooth high speed scrolling
- high resolution quality graphics
- high speed or step by step replay feature
- intriguing logical problems
- interactive dynamic puzzles

XOR MAZE GENERATOR

The XOR Maze Generator is a truly professional utility, in fact it's the very same generator we used to create the first collection of XOR puzzles. The package is fully menu driven and simple to use, the user simply places any predefined icons onto the maze screen. Included in the package is an ICON DESIGNER so that you can change the appearance of the game characters to baffle and delight your friends.

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Patience listing

From Page 43

```
   10 REM Patience
   20 REM By Paul Hodgkinson
   30 REM (c) Electron User
   40 IF PAGE>&E00 GOTO1700
   50 DIMno%(13):FORB%=0TO13:R
EADno%(B%):NEXT
   60 DATA32,65,50,51,52,53,54
,55,56,57,230,74,81,75,32
   70 A%=10:X%=670:Y%=0
   80 MODE1:*FX16
   90 VDU19,2,4;0;
  100 VDU23;8202;0;0;0;23,226,
54,127,127,127,62,28,8;23,224,
8,28,28,107,127,107,8,28,23,22
5,8,28,62,127,127,127,28,62,23
,227,8,28,62,127,62,28,8;23,23
0;38,105,41,41,41,38;
  110 PROCdbl("Patience",TRUE,
10):COLOUR1:PRINTTAB(15,25)"Th
inking"
  120 DIMcol%(6,13,3),stack%(3
),Pile%(24,1)
  130 PROCsetup
  140 Poi%=24:siz%=24:Move%=0
  150 CLS
  160 FORB%=0TO6
  170 PROCdbl(CHR$(B%+65),B%+3
+4,1)
  180 FORC%=1TO7-B%
  190 IFC%=7-B% PROCcard(col%(
B%,C%,0),col%(B%,C%,3),96+B%*1
04,960-64*C%) ELSEPROCblank(96
+B%*104,960-64*C%,2)
  200 NEXT
  210 NEXT
  220 PROCdbl("Stacks",31,1)
  230 FORB%=0TO3
  240 PROCcard(B%,0,B%*96+896,
896)
  250 NEXT
  260 PROCdbl("Pile-24",30,11)
  270 PROCcard(Pile%(24,0),Pil
e%(24,1),992,568):PROCblank(11
00,568,2)
  280 PROCdbl("Moves-0",28,29)
  290 PROCdbl("Command",28,21
)
  300 REPEAT
  310 VDU31,26,25:Succ%=TRUE
  320 B%=FNget:IFB%=-2THEN350
ELSEIFB%=TRUE PROCnext ELSEPRO
Csecond
  330 IFSucc%=TRUE THENMove%=M
ove%+1:PROCdbl(STR$Move%+" ",3
4,29) ELSEVDU7
  340 PRINTTAB(26,25);SPC(14)
  350 UNTILFNchec OR8%=-2
  360 IFB%<>-2 COLOUR2:PROCdbl
("Well done!",28,21)
  370 COLOUR1:PRINTTAB(24,27);
"Another go(Y/N)?"
  380 *FX15,1
  390 REPEAT:Z$=GET$:UNTILINSTR
("YN",Z$)
  400 IFZ$="Y"THENRUN ELSECLS:
END
  410 DEFPROCsecond
  420 PRINT" to ";:C%=FNget
  430 IFB%=-1ORC%=8ORC%=TRUE S
ucc%=FALSE:ENDPROC
  440 IFB%<7ANDC%<7 PROCmove E
LSEIFB%=7ANDC%<7 PROCstcol ELS
EIFB%<7ANDC%=7 PROCcolst ELSE
FB%=8ANDC%<7 PROCplcol ELSEPRO
Colst
  450 ENDPROC
  460 DEFPROCstcol
  470 st%=col%(C%,col%(C%,B,1)
,B):vl%=col%(C%,col%(C%,B,1),1
)
  480 ch%=2*(1-st%DIV2)
  490 IFstack%(ch%)=0 ORvl%<st
ack%(ch%)<>1 ch%=ch%+1:IFstack
%(ch%)=0 ORvl%=stack%(ch%)<>1
Succ%=FALSE:ENDPROC
  500 stack%(ch%)=stack%(ch%)+
1
  510 PROCcard(ch%,stack%(ch%)
,896+96*ch%,896)
  520 PROCaddst(ch%,1+stack%(c
h%)):ENDPROC
  530 DEFPROCaddst(S%,V%)
  540 IFcol%(C%,B,1)=13 Succ%=
FALSE:ENDPROC
  550 col%(C%,B,1)=col%(C%,B,1
)+1
  560 col%(C%,col%(C%,B,1),B)=
S%
  570 col%(C%,col%(C%,B,1),1)=
V%
  580 PROCcard(S%,V%,104+96*C%
,960-64*col%(C%,B,1))
  590 ENDPROC
  600 DEFPROCcolst
  610 IFcol%(B%,B,1)=0 Succ%=F
ALSE:ENDPROC
  620 st%=col%(B%,col%(B%,B,1)
,B)
  630 vl%=col%(B%,col%(B%,B,1)
,1)
  640 IFvl%-stack%(st%)<>1 Suc
c%=FALSE:ENDPROC
  650 PROCrem(1)
  660 stack%(st%)=stack%(st%)+
1
  670 PROCcard(st%,vl%,896+96*
st%,896)
  680 ENDPROC
  690 DEFPROCrem(down%)
  700 new%=col%(B%,B,1)-down%
  710 col%(B%,B,1)=new%
  720 IFcol%(B%,B,B)>new%ANDne
w%<>0 col%(B%,B,B)=new%
  730 MOVE104+96*B%,896-64*new
%
  740 PLOT0,88,0:PLOT83,-80,-6
4*(1+down%):PLOT83,80,0
  750 IFcol%(B%,B,1)>0 PROCcar
d(col%(B%,new%,B),col%(B%,new%
,1),104+96*B%,960-64*new%)
  760 ENDPROC
  770 DEFFNchec
  780 F%=0
  790 FORR%=0TO6
  800 F%=F%-(col%(R%,B,1)=13 A
NDcol%(R%,B,B)=1)
  810 NEXT
  820 =(F%=6)
  830 DEFPROCnext
  840 IFsiz%=0 MOVE992,568:PLO
T0,88,0:PLOT83,-80,-128:PLOT83
,80,0:Succ%=FALSE:ENDPROC
  850 REPEAT
  860 Poi%=Poi%-1:IFPoi%=0 Poi
%=24
  870 UNTILPile%(Poi%,1)
  880 PROCcard(Pile%(Poi%,0),P
ile%(Poi%,1),992,568)
  890 ENDPROC
  900 DEFPROCplcol
  910 IFsiz%=0 Succ%=FALSE:END
PROC
  920 vl%=Pile%(Poi%,1):st%=Pi
le%(Poi%,0)
  930 IFcol%(C%,B,1) IFst%DIV2
=col%(C%,col%(C%,B,1),B)DIV2 O
R col%(C%,col%(C%,B,1),1)-vl%<
>1 Succ%=FALSE:ENDPROC
  940 PROCaddst(st%,vl%)
  950 PROCgtpl
  960 ENDPROC
  970 DEFPROCgtpl
  980 siz%=siz%-1
  990 PROCdbl(STR$siz%+" ",35,
11)
 1000 Pile%(Poi%,1)=0
 1010 PROCnext
 1020 ENDPROC
 1030 DEFPROCplst
 1040 IFsiz%=0 VDU7:ENDPROC
 1050 st%=Pile%(Poi%,0):vl%=Pi
le%(Poi%,1)
 1060 IFvl%-stack%(st%)<>1 Suc
c%=FALSE:ENDPROC
 1070 stack%(st%)=stack%(st%)+
1
 1080 PROCgtpl
 1090 PROCcard(st%,vl%,896+96*
st%,896)
 1100 ENDPROC
 1110 DEFPROCmove
 1120 IFcol%(B%,B,1)=0 Succ%=F
ALSE:ENDPROC
 1130 IFcol%(C%,B,1)+1+col%(B%
,B,1)-col%(B%,B,B)>13 Succ%=FA
LSE:ENDPROC
 1140 IFcol%(C%,B,1)=0THEN1190
 1150 st%=col%(C%,col%(C%,B,1)
,B)
 1160 vl%=col%(C%,col%(C%,B,1)
,1)
 1170 IFcol%(B%,col%(B%,B,B),1
)+1<>vl%THENSucc%=FALSE:ENDPRO
C
 1180 IFcol%(B%,col%(B%,B,B),B
)DIV2=st%DIV2 Succ%=FALSE:ENDP
ROC
 1190 FORD%=col%(B%,B,B)TOcol%
(B%,B,1)
 1200 PROCaddst(col%(B%,D%,B),
col%(B%,D%,1))
 1210 NEXT
 1220 PROCrem(1+col%(B%,B,1)-c
ol%(B%,B,B))
 1230 ENDPROC
 1240 DEFPROCcard(Suit%,Val%,x
%,y%)
 1250 PROCblank(x%,y%,3)
 1260 VDU5:MOVEx%+4,y%-12
 1270 GCOL0,Suit%DIV2
 1280 VDUno%(Val%)
 1290 VDU224+Suit%
 1300 VDU4
 1310 ENDPROC
 1320 DEFPROCblank(x%,y%,C%)
 1330 GCOL0,C%:MOVEx%+4,y%-4:P
LOT0,72,0:PLOT81,-72,-128:PLOT
81,72,0
 1340 GCOL0,1
 1350 MOVEx%,y%:PLOT1,80,0:PLO
T1,0,-128:PLOT1,-80,0:PLOT1,0,
128:ENDPROC
 1360 DEFPROCdbl(A$,x%,y%)
 1370 IFx%<0 VDU31,20-LENA$DIV
2,y% ELSEVDU31,x%,y%
 1380 FORK%=1TOLEN4$
 1390 ?&70=ASCMID$(A$,K%)
 1400 CALL&FFF1
 1410 VDU23,255,?&71,?&71,?&72
,?&72,?&73,?&73,?&74,?&74,255,
8,10,23,255,?&75,?&75,?&76,?&7
6,?&77,?&77,?&78,?&78,255,11
 1420 NEXT
 1430 ENDPROC
 1440 DEFPROCsetup
 1450 FORB%=0TO48STEP4:B%!&C80
0=0:NEXT
 1460 D%=0:C%=1
 1470 FORB%=1TO52
 1480 REPEAT
 1490 Suit%=RND(4)-1:Val%=RND(
13)
 1500 UNTIL?(Val%+13*Suit%+&C7
F)=0
 1510 ?(Val%+13*Suit%+&C7F)=TR
UE
 1520 IFB%<29 PROCfill ELSEPil
e%(B%-28,0)=Suit%:Pile%(B%-28,
1)=Val%
 1530 NEXT
 1540 ENDPROC
 1550 DEFPROCfill
 1560 col%(D%,C%,0)=Suit%
 1570 col%(D%,C%,1)=Val%
 1580 C%=C%+1
 1590 IFC%=8-D% col%(D%,B,B)=C
%-1:col%(D%,B,1)=C%-1:C%=1:D%=
D%+1
 1600 ENDPROC
 1610 DEFFNget
 1620 *FX15,1
 1630 Z$=GET$
 1640 IFZ$>="A"ANDZ$<"N" PRINT
Z$;:=ASCZ$-65
 1650 IFZ$="S" PRINT"Stack";:=
7
 1660 IFZ$="P" PRINT"Pile";:=8
 1670 IFZ$="N" PRINT" Next";:=
-1
 1680 IFZ$="Q" PRINT" Quit";:=
-2
 1690 GOTO1630
 1700 REM Relocate
 1710 *KEY0 *T.|MD%=PAGE-&E00:
FOR I%=PAGE TO TOP STEP4:!(I%-&
E00)=!I%:NEXT:PAGE=&E00:MOLD|MRU
N|M
 1720 *FX138,0,128
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

This listing is included in this month's cassette tape offer. See order form on Page 53.

There's lots in here for you, too!

The Micro User isn't just for BBC Micro owners – those clever Acorn designers have ensured that the Electron is as compatible as possible with all BBC Micro and Master models. This means that quite a high proportion of programs written for the BBC Micro will also run on the Electron.

The June issue of *The Micro User* is packed full of interesting programs, utilities and articles for all Acorn computers and is an absolute must for Electron users. Contents include:

Prof McBrolly – Pit your wits against the goblins in this exciting arcade game. (This is best played with a Slogger Turbo).

Soft-Wear – Create and print out your own knitting patterns.

North by North-West – Enjoy the farming life in this Canadian agricultural simulation.

Library – High quality routines for you to use in your own programs.

What's in a rom – Everything you ever wanted to know about a rom but were afraid to ask.

Rom Directory – An up-to-date list of all the roms currently available for the BBC Micro.

Acorn's RISC Machine – Get the low down on Acorn's new microprocessor.

Begin Here – A series aimed at the novice programmer.

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Micro Messages

Way to painless spot removal

I BOUGHT a Plus 3 disc drive about six months ago and can thoroughly recommend the ADFS and 3.5in discs. At the same time, I ordered the Acornsoft disc-based Database (which you reviewed in January 1986)

Thumbing through the manual, it seemed that Database was ideal for me, with useful search features and the ability to create View macros.

But when I loaded it for a trial run – dismay! The ever-present spotty cyan background may look good on an RGB monitor, but is very painful to view on a black and white portable.

Frustration finally got the better of me, and I resolved to do something about it. Fortunately the program is not protected and only a couple of lines need be altered to change the background throughout.

After booting the disc, escape from the main menu and enter:

```
*CAT
*ACCESS MENU WR
LOAD "MENU"
LIST 100,110

100 MODE4:VDU19,0,0;0;19,1,2;
0;
110 VDU23,255,0,0,0,0,0,0,0,0
SAVE "MENU"
```

This produces green text on a black background, with no spots.

There isn't a routine included in Database to combine files – for example to combine in one new file, similar records which you have searched from various master files. I think this could be done. Has anyone worked out how to do it? – **John Atkinson, Tywardreath.**

● It's always good practice to experiment with backups, not your original (and valuable) discs.

Confusing filenames

LET me begin by congratulating you on your first class magazine which I consider very good value for money.

Could you please help me with two queries? Having followed the instructions laid down in the View manual to the letter I am still unable to save any material on to tape and then retrieve it.

Every time I type in:

```
Read Letter 1
```

and press return I get a "Marker not set" error message.

I have tried everything I can think of – even using a friend's equipment, but to no avail.

My second query is about my Centronics GLP. I am unable to get it to print in any mode other than single strike although once again I have followed the instructions and even tried all the remedies suggested in the various letters to Micro Messages in past issues.

Hoping you can help. – **B Morl, Woking, Surrey.**

● The filename is confusing View. You must use a single word no more than 10 characters long, so "Letter 1" is wrong and will produce an error report but, "Letter" is fine.

Either use a printer driver to insert printer control codes into the text (you'll find one in the August 1986 issue of *Electron User*) or, set up the printer from Basic before you enter View. For instance, the following codes will set condensed mode on an Epson:

```
VDU 2,15,3
```

Your GLP may require different codes so you'll have to look up the correct ones in your manual.

Joystick control

I RECENTLY bought a new Plus 1 and have found it to be ideal for my application. There is one thing troubling me. After buying Elite and trying to utilise the joystick facility I am unable to do so. Please could you explain why it is not possible. The game is on cassette.

Keep up the good work on the magazine! – **S.P.J. Musitano, Newbury, Berks.**

● You can't use joysticks with the Electron version of Elite – even though the instructions may say you can.

Check on memory

I HAVE a problem with Mini Office spreadsheet: After entering my requirements the program crashed with the error message "No room at...". Is there no way to find out if or when you are exceeding the memory capacity in this otherwise excellent program?

Also could you briefly explain to me how to upgrade my Electron: There are so many items on display in adverts it is all very confusing. I thought of a disc drive and cartridges.

My main interest is amateur radio and I need something with easier and quicker access than the cassette recorder. Please advise me before I go cross-eyed and brainless looking at the adverts. – **D. Mason, Wirral, Merseyside.**

● Mini Office is an excellent suite of programs for the Electron. However, it was not designed to handle vast amounts of data and should only be used for small applications. You can't tell how much memory is free, so save your work at fairly frequent intervals.

If you can't fit your speadsheet into Mini Office you would be better off with a rom-based program such as Viewsheet. If this still isn't big enough you'll have to buy a bigger computer with a much larger memory.

There are three disc systems available for the Electron: The Plus 3 (reviewed in the March 1985 issue of *Electron User*), Cumana (July 1985) and Plus 4 (June 1986). All operate in slightly different ways and each has its own advantages and disadvantages.

We would advise you to buy whatever your friends are buying – if everyone has the same disc system you can swap programs, games and utilities.

Software galore

I THINK your magazine is excellent. I especially like Micro Messages and Software Surgery. I think you should extend the software pages.

In answer to the letter in the April 1987 issue of Electron User *about Ravenskull – Superior Software's brilliant game – the scroll on the first level right down in the left hand corner by the*

→

From Page 47

Ravenbee will open the door to which there is no key.

I refer to the place almost in the centre of the first level where there are three doors fairly near each other. Stand just outside this door, use the scroll and as quickly as possible go through the door which has now gone. The second level is very difficult too.

Recently I found a way of getting on to the next screen in another Superior game – Mr Wiz. Press Caps Lk, 0 and 1 all together and you will progress to the next screen. I think Superior games are excellent, and the Hits Pack 3 is superb value for money.

Could you tell me what you think is the best winter Olympic game for the Electron? I have seen Winter Events for the Commodore but I don't think you can get it for the Electron.

Also, could you tell me if you have any news about Superior bringing out a follow-up to Citadel? If not, every Electon user who thinks Citadel is one of the best games ever should write to tell them they ought to bring out Citadel 2 soon. After all, they did it with Repton!

I have heard from friends with the Commodore 64 that Konami's hits pack of four games is excellent, but I am almost certain that you cannot get them for the Electron, though I know you can get Mikie and Yie are Kung Fu. If you can't get the pack can you get any of Ping Pong, Hyper Sports or Green Beret? – **Damon Wingfield, Portsmouth, Hants.**

● Tynesoft produces an excellent winter sports simulation called Winter Olympics. This was reviewed in the June 1986 issue of *Electron User*. There are rumours that Superior is working on a sequel to Citadel.

Ping Pong, Hyper Sports and Green Beret are not available. Commando by Elite is the nearest thing to Green Beret, but it is rather slow and is best played using Slogger's Turbo driver.

***WHAT would you like to see in future issues of* Electron User?**

What tips have you picked up that could help other readers?

Here is your opportunity to share your experiences.

Remember that these are the pages that you write yourselves. So tear yourself away from your Electron keyboard and drop us a line.

The address is:

Micro Messages
Electron User
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY.

Jump facility

IN REPLY to Paul Askew's letter in the April 1987 issue of Electron User *concerning the Ravenskull jump facility, here is how it is used.*

Once you have completed the first level without losing a life and have then lost all three lives on the next level you can jump.

Before starting level one again press J and where it says Jump a number 2 will appear and you can start on the next level. – **Andrew Plaistow, Sandy, Beds.**

Improved spelling . . .

I WOULD like to point out some errors that, I believe, exist in your excellent View spelling checker published in the May issue of Electron User.

The program as published contains an error in line 350. This should read:

```
350 C%=BGET #chan1:IF EOF #ch
an1 BPUT #chan2,C%:done=TRUE:
ENDPROC
```

This ensures that the last byte of the file, an &0D, is written to the output file. Otherwise it will not be accepted by View.

Line 530 is a little risky, since it assumes that all words ending in ing can also end in "er" and vice-versa. Similarly, not all words that end in "s" are plurals.

The method of storing just the beginning of the word in the dictionary can result in a misspelt word being accepted: If the spelling checker meets a word such as encounter, it will store encount in the dictionary. It will then accept the words encounting and encounts as correctly spelt.

Line 530 should only test for the 's endings to words to avoid this possibility. Thus:

```
530 IF RIGHT$(w$,2)="'s" w$=L
EFT$(w$,LEN w$-2)
```

When replacing a word that is not found, the checker does not test the word that is input against the dictionary. This allows a word to be input that is misspelt and can be avoided by changing line 580 to:

```
580 IF C%-ASC"r" INPUT"Replac
e with",w$:GOTO 520
```

Also, it is worth noting that the document created by the checker will not be correctly justified if words are replaced.

Please continue with the more advanced articles in your magazine and thank you for an excellent read. – **T.R. Ecott, Durrington, Worthing.**

● You are right about the last byte of the file being missed. If you end the View file with a blank line or two you will never see the problem and the program will run perfectly.

Line 530 tries to reduce the size of the dictionary by chopping off common word endings. For instance, take the words hunt, hunts, hunter, hunting and Hunt's. These would require five dictionary entries consuming a total of 33 bytes of memory if stored separately.

However, by chopping off the word endings only one dictionary entry – hunt – is required taking up just five bytes (four for the letters and an extra byte to mark the end of the word). Errors in all these words will still be detected even though there is only one entry in the dictionary.

This makes the space required by the dictionary much smaller and as an added bonus is consequently it is much faster to search as well.

The Electron is not overblessed with memory, so Spelling Checker is a compromise between accuracy and dictionary size.

. . . improved program

I WOULD like to advise you that some errors have crept in to Spelling Checker in the May issue of Electron User. *Although most program errors I have suffered in the past have been found to be due to mistakes I have made in copying them, in this case it has not been so.*

In lines 100, 330, 860, 880, 920 and 960 a minus sign has been used as a separator, which is not accepted by the Electron. With these replaced by an underline character the program ran perfectly.

I also found difficulty in getting the dictionary to save, and after some time realised that name$ *entered in line 270 was confusing the issue. I changed line 270 and 280 to* cname$ *and resolved my problem.*

In conclusion I would like to say that I find your articles most informative and useful. I wonder if it would be possible for you to do some explanatory articles based on the Library included on the Welcome disc? Some of these programs are a bit confusing and the Help information is too vague. – **Colin Thomas, Rugby, Warks.**

● Underline characters were used in the program, but unfortunately the laser typesetting machine used to print our listings had the wrong character set loaded and all underlines came out as minus signs.

You shouldn't experience any problems loading and saving the dictionary, it sounds like you've made a typing error.

Siamese micros

THANK you for publishing the passwords and editor codes for Repton 3, they have helped me complete the game.

The other day, while using my Electron, I typed:

```
*HELP
```

and found that an RS423 port is listed. Could you please tell me how to access the port as it has no socket.

I plan to connect the Electron to my BBC B+ so I can use some rom cartridges on my BBC Micro. If this is possible could you please tell me how to make the connection and how to link the two keyboards together so they control both computers. – **Geoffrey Scott, Earls Barton, Northants.**

● You can't use the Plus 1's RS423 as it hasn't got one! Ignore the message on the screen.

You can link an Electron to a BBC Micro using the cassette ports or by adding an RS423 port to a Plus 1 or Rombox, but it will drastically reduce the speed of both micros and you can't control one micro from the other's keyboard.

What you need is a second processor, sideways ram or a rom board for your BBC Micro.

Making a !BOOT file

A FEW weeks ago while typing my higher engineering project into my Electron I started to wish I had a disc drive, not only for speed but also for the facility of a !BOOT file.

Each time I switched on the computer I wasted a lot of time loading the printer driver, defining the function keys and other things which could all be done by means of a !BOOT file on disc.

*Remembering how to create a !BOOT file for View gave me an idea. I made a !BOOT file and saved it to tape in the usual way, then loaded it back in using *EXEC and found it to work in the same way as a disc !BOOT file.*

The file I now use is:

```
*WORD
MODE3
NEW
*FX6
*FX16
*KEY1 SHEETS|M
*KEY2 PRINT|M
*KEY3 SCREEN|M
*KEY4 FORMAT|M
*KEY5 CLEAR|M
*KEY6 REPLACE
*KEY7 *FX202|M*FX16|MNEW|MREA
D
*KEY8 *FX16|MNEW|M*EXEC NEW|M
*KEY9 *CAT|M
*KEY0 SAVE|M|M
*KEY10 *FX202,48|FX16|MMODE3|
M|S&4000
PRINTER DMP2000
```

I have subsequently made !BOOT files for many of my other programs, all of which work perfectly.

I would be grateful if you could inform me whether the adventure The Lord of the Rings is available for the Electron as it seems to be available for all the other computers. – **Ian Smith, Kinross, Tayside.**

● Lord of the Rings is not available for the Electron.

Automatic loading

I HAVE an Electron, Slogger Rombox with View and Viewsheet rom cartridges and an ACP4 interface with 3.5in disc drive which I use regularly. I have decided to place all my letters and spreadsheets on a menu I have written but unfortunately I have a problem.

*After the choice has been selected the program will go into Mode 3 and then call View or Viewsheet with *W. or *SH. and that is as far as it will go.*

I want to be able to make the desired menu selection and then get View/Viewsheet to READ or LOAD the selected file automatically from disc. Can you help? – **Martin Mulburn, Middlesbrough, Cleveland.**

● One way to load a file into View or Viewsheet automatically is to define a function key and insert the key number into the keyboard buffer.

For instance:

```
10 *KEY0 *WORD|MLOAD Text|M
20 *FX138,0,128
```

when run will enter View and load the file called *Text*. Change the filename to whatever file you wish to load and insert the lines into your menu program.

Machine code listings

I HAVE been reading a book on machine code and it says the only way you can list a program is by decoding it from its memory block with a special program called a disassembler. Do you know where I could get one?

I must say I'm extremely pleased that Superior Software, has released its Volume 3 collection on disc and I hope there are many more.

My favourites in your mag are adventures, software reviews and your excellent listings. – **Robert Cundy, Weymouth, Dorset.**

● You'll find a disassembler in the June 1985 issue of *Electron User*. Slogger's *Trek rom is an excellent disassembler which comments on the code as it disassembles it.

ACP's Advanced Disc Toolkit contains a very powerful version which will disassemble forwards, backwards, follow JMPs, JSRs and branches.

Control codes

YOUR August 1986 issue gave a good review of the Amstrad DMP 2000 printer so I bought one to help me check listings and it is indeed excellent. I am, however, a bit lost when it comes to the machine code section of your View printer driver in the same issue.

Basically I don't understand how to alter the control codes, not being that well versed in assembly language. Can you please assist by telling me exactly how to alter the program – my View cartridge refuses to print out.

Please keep up the excellent standard of Electron User and include more games with good graphics and some educational ones too. – **D.Hazzard, St. Briavels Common, Nr. Lydney, Glos.**

● Most of the printer driver's functions are compatible with the DMP2000 and you shouldn't have any printing problems. We can only assume that you have made a typing error. Please check your listing carefully.

The program is a printer driver generator and should be loaded and run from Basic. It creates a machine code printer driver file which can then be loaded into View.

To print a file from View enter command mode and type:

```
PRINT
```

or:

```
SHEETS
```

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

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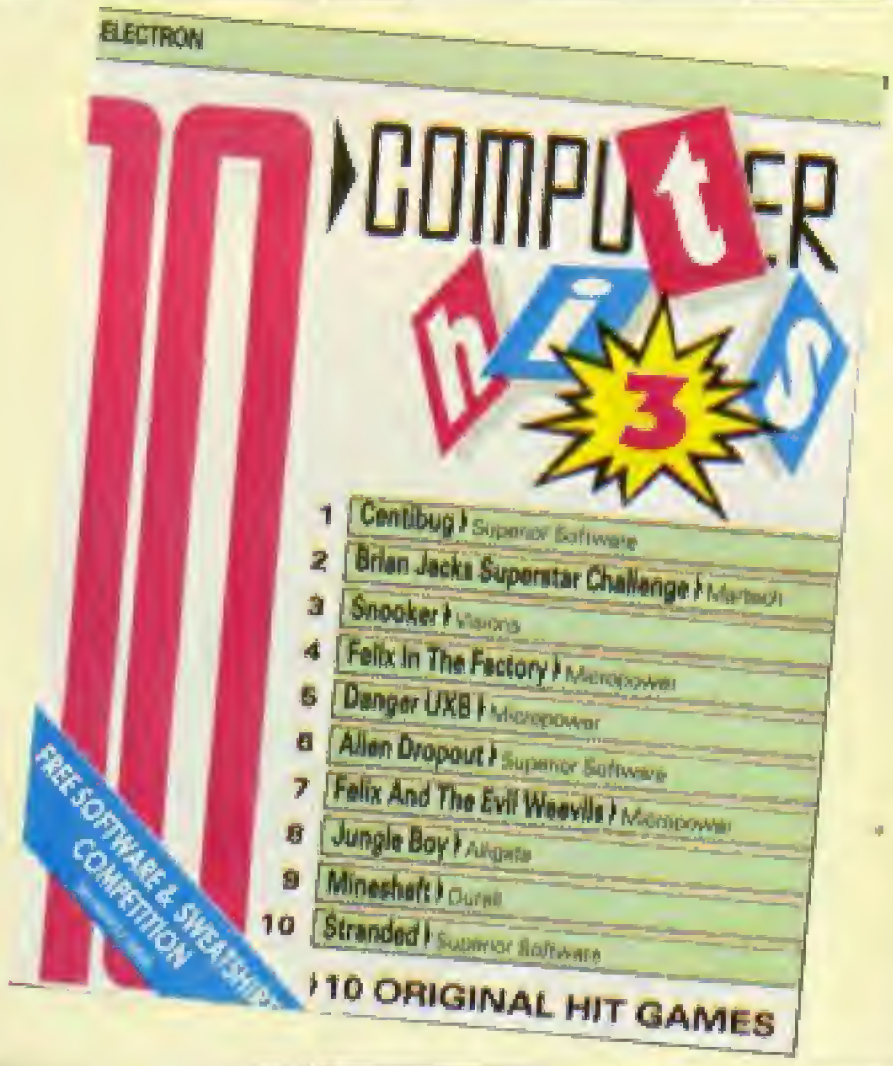

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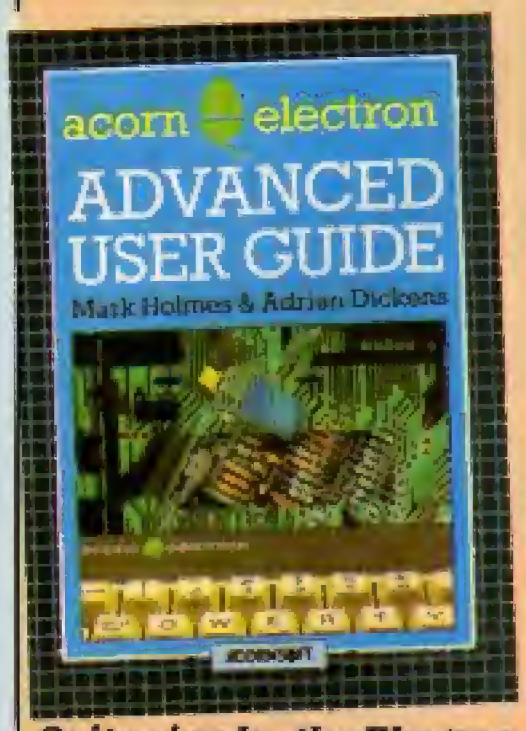

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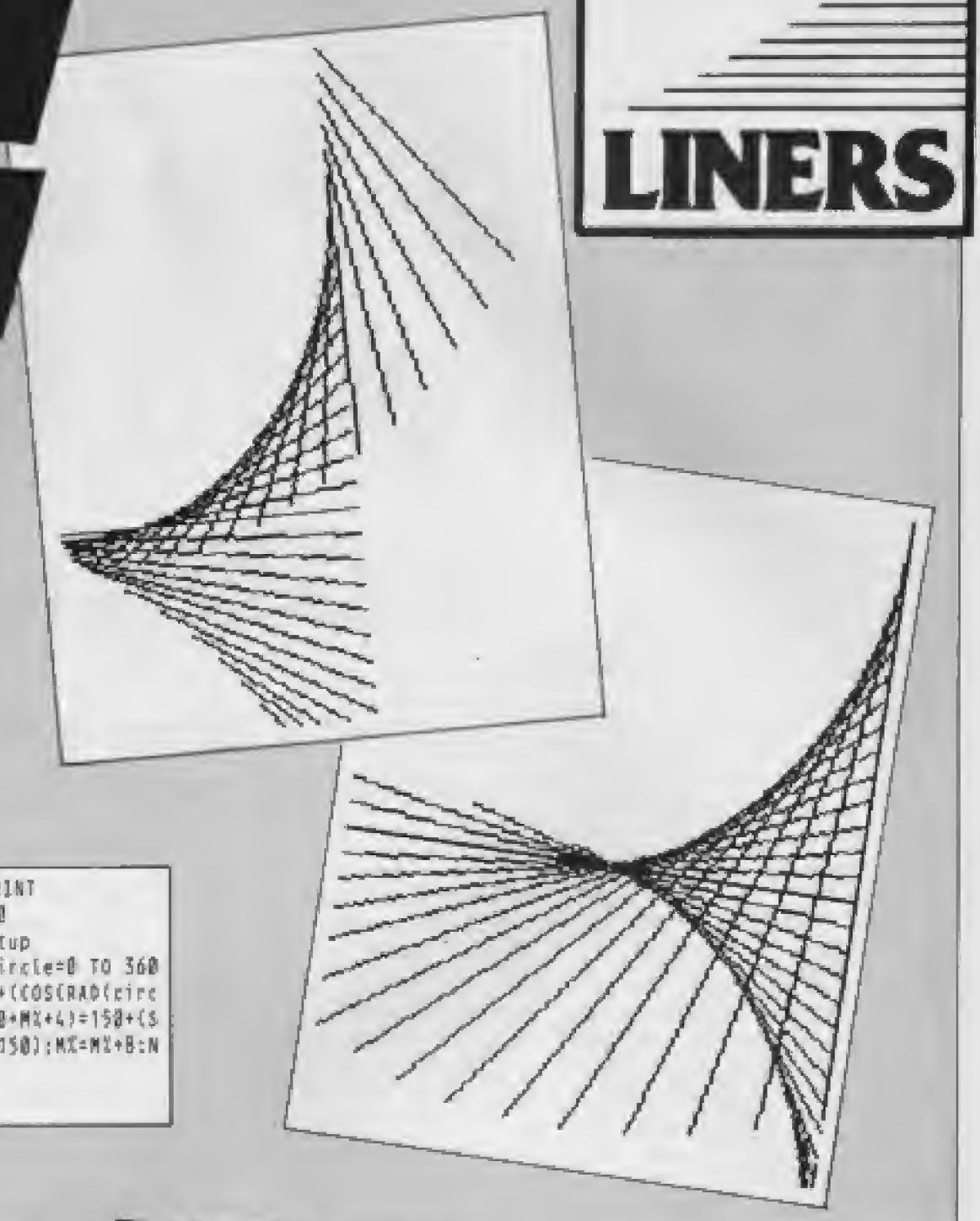
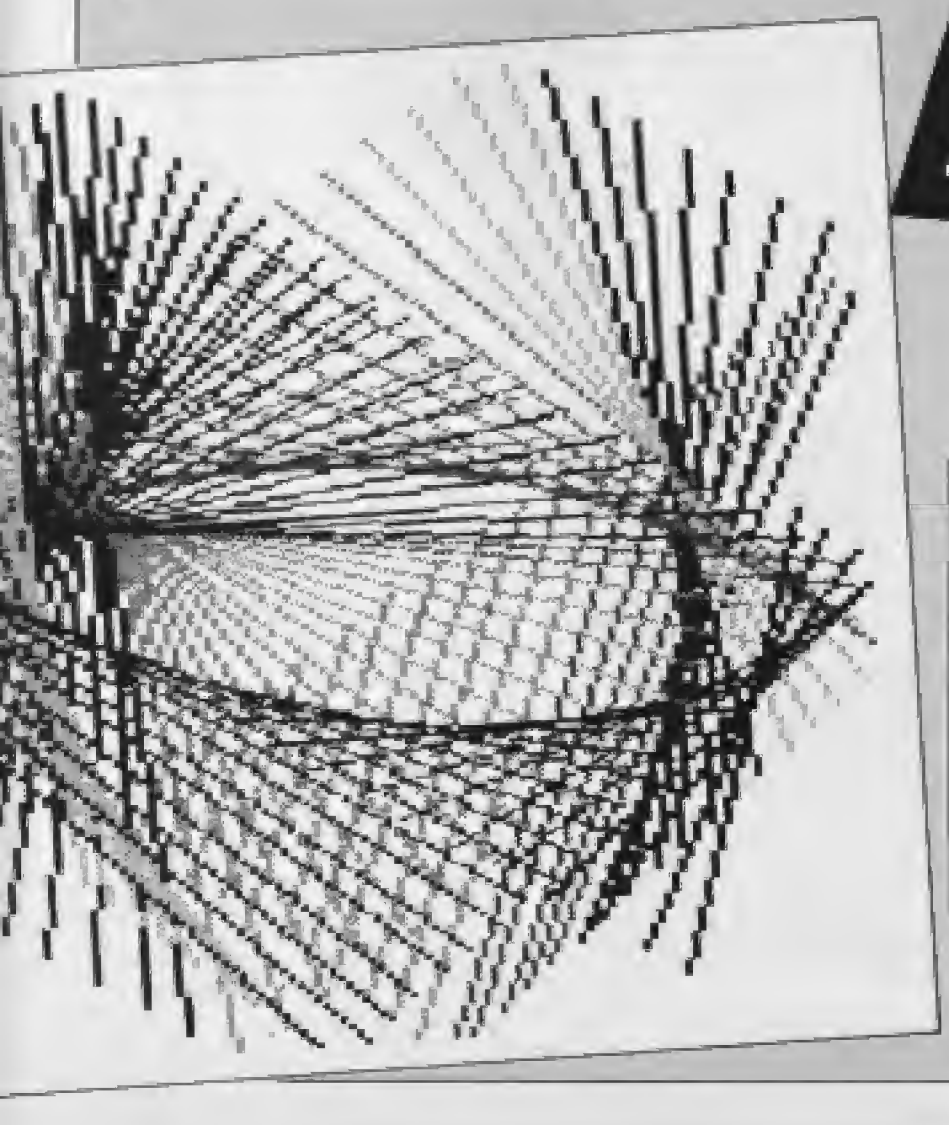


WHAT can you do in 10 lines with just one MOVE and one DRAW statement? Not a lot? Well think again as you watch this superb demonstration of animated line graphics written by Gareth Howells. The constantly moving display is almost hypnotic, and this short program demonstrates what can be achieved with a little imagination.

```
   1 REM Spiral Twister
   2 REM By Gareth Howells
   3 MODE 4:VDU19,1,1;0;19,0,
3;0;23,1;0;0;0;0;:PRINT TAB(0,
31):PROCsetup
   4 REPEAT: rnd=8+(RND(8))
   5 FOR loop%=&2000 TO &2038
STEP rnd
   6 MOVE 640,150:DRAW !(loop
%),!(loop%+4):PRINT
   7 NEXT:UNTIL0
   8 DEF PROCsetup
   9 MX=0:FOR circle=0 TO 360
:!(&2000+MX)=640+(COS(RAD(circ
le))*150):!(&2000+MX+4)=150+(S
IN(RAD(circle))*150):MX=MX+8:N
EXT
  10 ENDPROC
```

Line Bounce



LINE graphics seem to be in vogue this month. Here's another impressive demonstration – this time from C. Morgan. A line bounces round the screen, changing colour when it hits the edges, producing a psychedelic display. It shows what you can do with a few DRAW statements and a REPEAT . . . UNTIL loop.

```
 1 MODE2:G%=1:GCOL0,G%:VDU2
3,1,0;0;0;0;:X1%=RND(1279):Y
1%=RND(1023):X2%=X1%+RND(25)-5
0:Y2%=Y1%+RND(25)-50:A%=RND(75
)-50:B%=RND(75)-50:C%=RND(75)-
50:D%=RND(75)-50:REPEAT MOVEX1
%,Y1%:DRAWX2%,Y2%:IF G%>6 OR G
%<0 THEN G%=0
   2 X1%=X1%+A%
   3 IF X1%>=1279 OR  X1%<=0
THENA%=-A%:G%=G%+1:GCOL0,G%
   4 Y1%=Y1%+B%
   5 IF Y1%>=1023 OR  Y1%<=0
THEN B%=-B%:G%=G%+1:GCOL0,G%
   6 X2%=X2%+C%
   7 IF X2%>=1279 OR  X2%<=0
THEN C%=-C%:G%=G%+1:GCOL0,G%
   8 Y2%=Y2%+D%
   9 IF Y2%>=1023 OR  Y2%<=0
THEN D%=-D%:G%=G%+1:GCOL0,G%
  10 UNTIL FALSE
```

DFS upgrade with BBC compatability

MARK SMIDDY puts Slogger's SEDFS through its paces

THE official disc system for the Electron is Acorn's Plus 3 and although a powerful system, it uses up more than 3.7k of your memory.

Cumana soon solved the problem with its internal memory floppy disc system, and PAGE remains set at E00. This was reviewed in *Electron User*, July 1985. So where's the problem? I hear you cry.

It's down to that age old computer hang up that we all suffer from at one time or another – compatibility.

A disc system that cannot talk to other disc systems is at a disadvantage compared to one that can.

Cumana did offer some solutions on its utilities disc, which included software to read and write other formats such as Acorn's ADFS and DFS. Which is fine just as long as you don't need to do it very often.

It also means that you can't take advantage of all of the specially written software such as disc menus, disc editors and so on, that appears in magazines and on roms from time to time.

This is precisely the sort of problem that the new SEDFS from Slogger is designed to overcome – but does it?

Designing a DFS from scratch is not easy at the best of times, but trying to make it software compatible with someone else's format is another thing again. To the software or the user the DFS must appear to work in exactly the same way as the official Acorn DFS.

Putting the unit through its paces reveals that you can have the whole lot up and running in less than 15 minutes. Even for hamfisted amateurs like me, changing the rom is not too difficult. And if you buy the complete thing it's simply a matter of plug in and go.

Switch on and if all's well the message:

Acorn Electron

Slogger EDFS

BASIC

appears, and looks very friendly too.

"It's worth remembering that because of all these utilities are built in, you don't have to go rummaging for that utilities disc you lost months ago".

One quick *HELP later and the Slogger announces that it has DFS and UTILS built in and worth further inspection. Figure I shows the HELP screen.

It is here that the SEDFS starts to flex its muscles, adding four new and useful commands to the original Acorn list: MAP, MCOPY, RUNPROT and STAT.

*MAP and *STAT are used to discover how much disc space is available and how it is being used.

*MCOPY is similar to *COPY but it copies as many files as memory will allow, not just individual ones, between disc swaps.

*RUNPROT is concerned with Slogger's Tape to Disc Utility and makes use of the internal ram of the DFS while it is loading a program.

Looking further, requesting HELP on the UTILS (figure II) shows four more utilities are available than on the Acorn: *DATE, *FORMAT, *FDCSTAT and *VERIFY. It's worth remembering here that because all of these utilities are built in, you don't have to go rummaging for that utilites disc that you lost months ago, just because you want to format one disc.

*FDCSTAT reveals the

```
>*HELP DFS
Expansion 1.00
  ADC/Printer/RS423
Slogger EDFS 1.01
  ACCESS      <afsp> (L)
  BACKUP      <src drv> <dest drv>
  COMPACT     (<drv>)
  COPY        <src drv> <dest drv> <afsp>
  DELETE      <fsp>
  DESTROY     <afsp>
  DIR         (<dir>)
  DRIVE       (<drv>)
  ENABLE
  INFO        <afsp>
  LIB         (<dir>)
  MAP         (<drv>)
  MCOPY       <src drv> <dest drv>
  RENAME      <old fsp> <new fsp>
  RUNPROT     <fsp>
  STAT        (<drv>)
  TITLE       <title>
  WIPE        <afsp>

OS 1.00
```

Figure I: DFS help screen

```
>*HELP UTILS
Expansion 1.00
  ADC/Printer/RS423
Slogger EDFS 1.01
  BUILD       <fsp>
  DATE        <argument>
  DISC
  DUMP        <fsp>
  FORMAT      (<drv>)
  FDCSTAT
  LIST        <fsp>
  TYPE        <fsp>
  VERIFY      (<drv>)

OS 1.00
```

Figure II: Utilities help screen

status of the floppy disc controller chip at the last error.

*DATE gives the current time and date held in the battery backed up ram inside the Cumana DFS.

Another nice feature is *OPT 8,255 which causes the SEDFS to automatically detect a 40 track disc in an 80 track drive and still be able to read it. In fact, SEDFS is so good that I can't easily find fault with it.

The manual is quite simply the best of the type I have seen, charged full of very useful information to suit everyone from the beginner to the professional. Early issues lacked an index but a new one is promised very soon.

Included is a section on overlays, how to fit a 20k plus program into memory at once. This text is a delight to read and other manufacturers would do well to follow Slogger's lead in this area.

There is nothing I hate more than buying a product only to find that I have to spend another £20 on manuals to learn how to use it.

Some readers familiar with BBC Micro history may have heard of the much maligned 8271 FDC. Software houses designed many disc loaders around the internal workings of the 8271 so any new DFS would benefit greatly from having that compatibility. Here too the SEDFS scores highly, with a virtual 100 per cent 8271 emulation to Acorn specifications.

So the SEDFS has all of the nice features that we have come to expect from Slogger. But how well does it perform as a filing system?

For the answer to that question we put it through some very tough trials. Result: Top marks right across the range, even to the extent that some of the bugs in the original Acorn DFS have been ironed out.

One of the most notable is where you have two drives, select the second drive and then try to !BOOT the disc. Acorn's DFS quite merrily returns back to the first drive and spins away waiting for a disc.

The SEDFS performed admirably throughout. Speedwise it is not very exciting, but it's no worse than any comparable DFS that I've seen and it would be unfair to benchmark test it against the Electron ADFS, except to say that it does perform very favourably.

To anyone used to the tape format, discs offer speed and reliability beyond compare. And to anyone considering upgrading to discs who needs thorough BBC compatibility the SEDFS is the logical choice.

Though I must say that given the choice and the money I think I'd tend to get the ADFS; since I haven't, the editor's going to have trouble getting this review copy back.

If you already have the old Cumana DFS I can recommend the SEDFS upgrade unreservedly. ■

Dragon's Curve...

MIKE COOK uses one to explain two complex topics — fractals and recursion

RECURSION and fractals are two fairly common topics discussed by computer buffs these days. But what do they mean?

Well, I always try to explain complex topics pictorially, so here is a short program to draw a Dragon's Curve illustrating these two subjects.

It incorporates what I like best in graphics programming – not a lot of typing in and a complex looking result. In fact 11 lines set up the variables and 13 lines draw the curve.

This economy is achieved through the use of recursion, that is a procedure that calls itself. Let's see what happens.

Lines 240 to 290 contain a procedure called PROC_DRAW which simply draws a straight line in one of four directions up, down, left or right.

The direction depends upon the value stored in the variable *D%*. The length of line is given by the variable *X%* and it is one of the parameters you enter when the program is run.

The curve is drawn by the procedure PROC_CURVE and it is passed two parameters, *S%* and *L%*.

The first sets the length of line to draw and the second tells it whether to draw the curve or not.

The variable *L%* is the level of procedural calls – the level of recursion.

If it is equal to 0 a line is drawn, if it is not, a curve to the left and to the right of the current position is drawn. Note that this procedure is the one that draws the curve and will call itself twice.

Now to prevent your Electron calling the procedure for ever. Each time it calls itself the level variable *L%*, is reduced by one. Thus it will eventually reach zero and a line will be drawn.

This is our escape route, and the nested procedures can claw their way out of the hole they have just dug for themselves.

Remember that each time a procedure is invoked it is passed a fresh set of variables, hence *L%* shows how deep the recursion is at any time.

The depth of recursion on the Electron is limited only by the amount of free memory available, so if you try to go too deep you will get a no room error.

Also as the recursion gets deeper the curve gets larger and you will find only part of it being displayed on the screen.

Finally you can tinker with the program using a GCOL statement to change the colour or have several curves displayed around the screen.

The Dragon's Curve is a class of curves known as fractals. A fractal is a space-filling curve of infinite length but bounding a finite area.

As it is clearly impossible to draw a line of infinite length (well, you could but it would take an infinite length of time!) we can make an approximation to it of a given order. This is the level variable given at the start of the program.

If you wish to see what is happening try printing out the recursion level at the start of the procedure PROC_CURVE.

Use a TAB command so that it is always printed in the same position, and include a small delay loop so that you will be able to see what is happening.

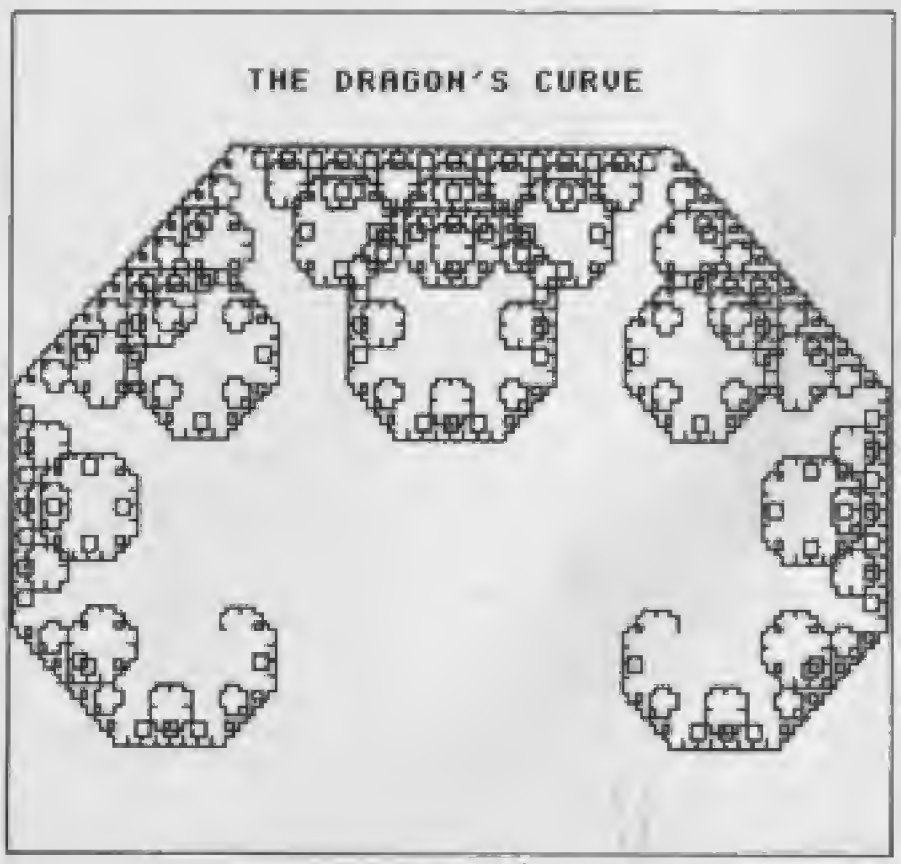
The peculiarity of fractal curves is that the more curve you examine the more you see the same pattern.

If you could zoom in on a section of the curve you would see the same pattern repeating.

This mirrors the way some natural events behave, and fractals have been observed in phenomena as diverse as the flood levels of the Nile and magnetic activity on the sun.

The result is that most fractals are both interesting and beautiful and because of recursion they are quite easy to program. Have fun experimenting with Dragon Curves. ■

```
 10 REM Dragon Curve
 20 REM By Mike Cook
 30 MODE 1:*FX16
 40 PRINT"THE DRAGON'S CURV
E"
 50 COLOUR 2
 60 PRINT"Try the values 5
,12 to start"
 70 INPUT"ENTER SIZE AND OR
DER ",S%,L%
 80 CLS:PRINTTAB(10)"THE DR
AGON'S CURVE";
 90 GCOL0,1:DRAW 0,1023:DRAW
 1278,1023:DRAW 1278,0:DRAW 0,
0
100 GCOL0,3:MOVE 964,300
110 D%=0:S%=S%+2
120 VDU 23;8202;0;0;0;
130 PROC_CURVE(S%,L%)
140 END
150
160 DEF PROC_CURVE(S%,L%)
170 IF L%=0 THEN PROC_DRAW(S
%):ENDPROC
180 PROC_CURVE(S%,L%-1)
190 D%=D%+1 AND 3
200 PROC_CURVE(S%,L%-1)
210 D%=D%-1 AND 3
220 ENDPROC
230
240 DEF PROC_DRAW(X%)
250 IF D%=0 PLOT 1,X%,0
260 IF D%=1 PLOT 1,0,X%
270 IF D%=2 PLOT 1,-X%,0
280 IF D%=3 PLOT 1,0,-X%
290 ENDPROC
```



WRITING SOFTWARE TO READ THE ADC

Part VI of JOE PRITCHARD's Plus 1 series

THIS month we see how we can use the analogue port from within machine code programs. We'll also take a look at events and the ADC.

This isn't intended to be a tutorial on 6502 machine code so I'm going to assume that you have a basic knowledge of assembly language.

Accessing the ADC from machine code is fairly easy and all the Basic ADVAL functions can be carried out using standard osbyte operating system calls.

The call that simulates ADVAL is osbyte 128. The A register is loaded with the osbyte call number, 128, and the X register holds a value in the range 0 to 4 – the same as the argument passed to the ADVAL function in Basic. Thus, ADVAL(3) in machine code is:

```
LDX #3
LDA #128
JSR &FFF4
```

On exit from the osbyte call, the X and Y registers hold the ADVAL value. The lower eight bits are stored in the X register and the eight most significant bits are in the Y register. The functions offered by osbyte 128 are summarised in Table I.

FX16, 17 and 190 calls are also executed from machine code using osbyte. These translate to:

```
LDA #16
LDX #n
JSR &FFF4

LDA #17
LDX #n
JSR &FFF4

LDA #190
LDX #n
JSR &FFF4
```

ENTRY	EXIT
X=0	Y=last channel of the ADC to be converted. If no channels have completed a conversion yet then Y=0.
X=1-4	Reads channels 0 to 3 of the ADC. The result of the reading is returned in X and Y.

Table I: Osbyte 128 functions.

As an example of the use of machine code to read the ADC, you might like to try Program I. This simply starts a conversion, waits until it is completed, then reads the converted value back and prints the result in Basic.

We initiate a conversion with FX17 in lines 210 to 230, then wait until the ADC signals that it has finished, lines 240 to 290. Finally we read the value and store it in &70 and &71.

Programs that read the ADC from machine code won't be that much faster than Basic, simply because we still have to wait until the ADC has completed its conversion. So why do we bother with writing programs to handle the ADC from machine code?

Well, if we write a program in which everything else is in machine code then it makes sense to read the ADC from machine code as well.

Secondly, some programming applications involving the ADC can't be done from Basic. On the Electron, these are often applications that involve events, a form of interrupt.

The operating system stops whatever it is doing every every 10 milliseconds and sees whether there are any important tasks waiting to be done. For instance, it has to read the keyboard every now and then to see if you've pressed a key and to keep the clock up to date.

So the operating system interrupts whatever it is doing at regular intervals, performs these tasks, then returns to whatever it was doing before it was interrupted.

The operating system in the Electron relies quite heavily on interrupts for many tasks, but not all are performed every time an interrupt occurs.

For instance, the flashing colours flash twice a second yet the clock ticks every 1/100th of a second. And some tasks are only dealt with as and when required.

There is even provision for you to add your own tasks to the list it must perform during an interrupt.

You can tell the operating system that it must perform your task every time a particular event occurs – say every time the clock ticks, or whenever you tap a key.

The task the operating system must perform is a short piece of machine code called an event routine – because it is executed every time a particular event occurs.

The operating system must be told which event to watch out for and where our machine code event routine is stored so it can add it to the list of tasks it must perform.

We'll see how we can use the ADC conversion complete event. This occurs whenever the ADC in the Plus 1 finishes a conversion of one of the channels. To

→

```
10 REM Program 1
20 REM Read an ADC channel
30 REM and return result to
40 REM BASIC for printing
50 :
60 PROCassemble
70 *FX16,1
80 REPEAT
90 CALL convert
100 PRINTTAB(10,10)"Reading:
";?&70+(256*?&71);"
110 UNTIL FALSE
120 :
130 DEFPROCassemble
140 DIM code% 100
150 FOR pass=0 TO 2 STEP 2
160 osbyte=&FFF4
170 P%=code%
180 [
190 OPT pass
200 .convert
210 LDA #17
220 LDX #1
230 JSR osbyte
240 .wait
250 LDA #128
260 LDX #0
270 JSR osbyte
280 CPY #0
290 BEQ wait
300 LDA #128
310 LDX #1
320 JSR osbyte
330 STX &70
340 STY &71
350 RTS
360 ]
370 NEXT pass
380 ENDPROC
```

Program I

```
 10 REM Program II
 20 REM Using the ADC
 30 REM conversion event
 40 REM for something useful
 50 :
 60 PROCassemble
 70 CALL initialise
 80 TIME=0
 90 REPEAT
100 PRINT TIME
110 UNTIL TIME>100
120 *FX13,3
130 PRINT "Press SPACE to se
e stored values"
140 *FX15,1
150 REPEAT
160 UNTIL GET=32
170 FOR I%=cache TO cache+20
8 STEP 2
180 PRINT ?I%+256*?(I%+1)
190 NEXT
200 END
210 :
220 DEFPROCassemble
230 DIM cache 300
240 DIM code 100
250 osbyte=&FFF4
260 FOR pass=0 TO 2 STEP 2
270 P%=code
280 [
290 OPT pass
300 .initialise
310 LDA #event MOD 256
320 STA &220
330 LDA #event DIV 256
340 STA &221
350 LDA #cache MOD 256
360 STA &70
370 LDA #cache DIV 256
380 STA &71
390 LDA #14
400 LDX #3
410 JSR osbyte
420 LDA #16
430 LDX #1
440 JSR osbyte
450 RTS
460 ;
470 .event
480 PHA
490 PHP
500 TXA:PHA
510 TYA:PHA
520 LDA #128
530 LDX #1
540 JSR osbyte
550 TYA
560 LDY #1
570 STA (&70),Y
580 TXA
590 DEX
600 STA (&70),Y
610 CLC
620 LDA &70
630 ADC #1
640 STA &70
650 LDA &71
660 ADC #0
670 STA &71
680 PLA:TAY
690 PLA:TAX
700 PLP
710 PLA
720 RTS
730 ]
740 NEXT
750 ENDPROC
```

Program II

From Page 59

enable this particular event the instruction:

```
*FX14,3
```

is used. Now the operating system will execute your routine when this event occurs. To disable the event use:

```
*FX13,3
```

How does the OS know where your code is? It simply calls the routine whose address is held in the two bytes &220 and &221 – the event vector. The first byte holds the low byte of the address of the routine and the second holds the high one.

Clearly the event vector should be pointing the machine code routine before the event is enabled, otherwise, a crash could result.

The code should preserve all the registers that it uses and should also take less than two milliseconds to execute. Anything that takes longer than this could lead to problems – the Electron will slow right down to a snail's pace for a start.

In addition, it's not a good idea to use oswrch or some of the other OS routines.

For the particular event that we're interested in, the machine code is entered with the A register holding the value 3 and Y holding the number of the channel that has just finished conversion. This is set up for us by the OS.

The value in the A register indicates the type of event that has occurred. All events go through the same event vector, so if we have several events enabled at the same time we may want to know which particular one has just occurred.

In this case, with only the ADC event enabled, it doesn't really matter about the A value, and we can ignore it.

Program II gives a simple demonstration of events in action. While the value of TIME is being printed to the screen, the event routine is entered every 10 milliseconds and the reading from the ADC stored in an area of memory called *cache*.

With a few alterations to the program it would be possible to get it to store say, only one reading per second or minute and so allow you to take readings of a slowly altering value while doing other things with the micro.

Of course, you would have to take care that the *cache* area of memory was big enough to store all the readings and that your other programs didn't overwrite the event handling routine or the stored readings.

As for the program itself, *initialise* sets up the event vector, stores the address of *cache* in page zero, enables the event with a call to osbyte 14, then turns off all ADC channels except channel 0 with a call to osbyte 16.

From this time on until the event is disabled the event routine is entered every 10 milliseconds. Locations &70 and &71 hold the address at which the next reading is to be stored and are updated after every reading.

Program III is a further example of event programming and should give those of you who built the games paddle in April 1987 issue of *Electron User* a few ideas for software.

```
 10 REM Program III
 20 REM ADC used for
 30 REM keyboard input
 40 :
 50 PROCassemble
 60 CALL initialise
 70 END
 80 :
 90 DEFPROCassemble
100 DIM code 100
110 osbyte=&FFF4
120 FOR pass=0 TO 3 STEP 3
130 P%=code
140 [
150 OPT pass
160 .initialise
170 LDA #event MOD 256
180 STA &220
190 LDA #event DIV 256
200 STA &221
210 LDA #14
220 LDX #3
230 JSR osbyte
240 LDA #16
250 LDX #1
260 JSR osbyte
270 RTS
280 ;
290 .event
300 PHA
310 PHP
320 TXA:PHA
330 TYA:PHA
340 LDA #128
350 LDX #1
360 JSR osbyte
370 TYA
380 CLC
390 ROL A
400 BCC lownumber
410 LDY #ASC("Z")
420 LDA #138
430 LDX #0
440 JSR osbyte
450 JMP out
460 .lownumber
470 LDY #ASC("X")
480 LDX #0
490 LDA #138
500 JSR osbyte
510 .out
520 PLA:TAY
530 PLA:TAX
540 PLP
550 PLA
560 RTS
570 ]
580 NEXT
590 ENDPROC
```

Program III

The conversion complete event is used to allow inputs to the analogue port to simulate presses on the keyboard. As it stands, readings on channel 0 are taken as a Z if the reading is greater than 32765 and as an X if it is less.

Once the event is enabled either X or Z will be inserted into the keyboard buffer every 10 milliseconds – this will rapidly fill up the keyboard buffer as you'll see if you run the program.

These keypresses will be picked up by GET or INKEY like any other keypress, so you could add this facility to your own programs.

You might like to add a few lines to read the PB inputs, or give a dead area in the middle of the ADC output range, perhaps between 15000 and 45000, where no keypress is returned.

● *That's all for now. Next time we'll take a look at Advanced Computer Product's Plus 5 and see what we can do with it.*

Ravenskull

For the BBC MICRO ELECTRON

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The Elf escapes from a Ravenbee

Close-up of a Crystal Ball

The Adventurer collects a Treasure Chest

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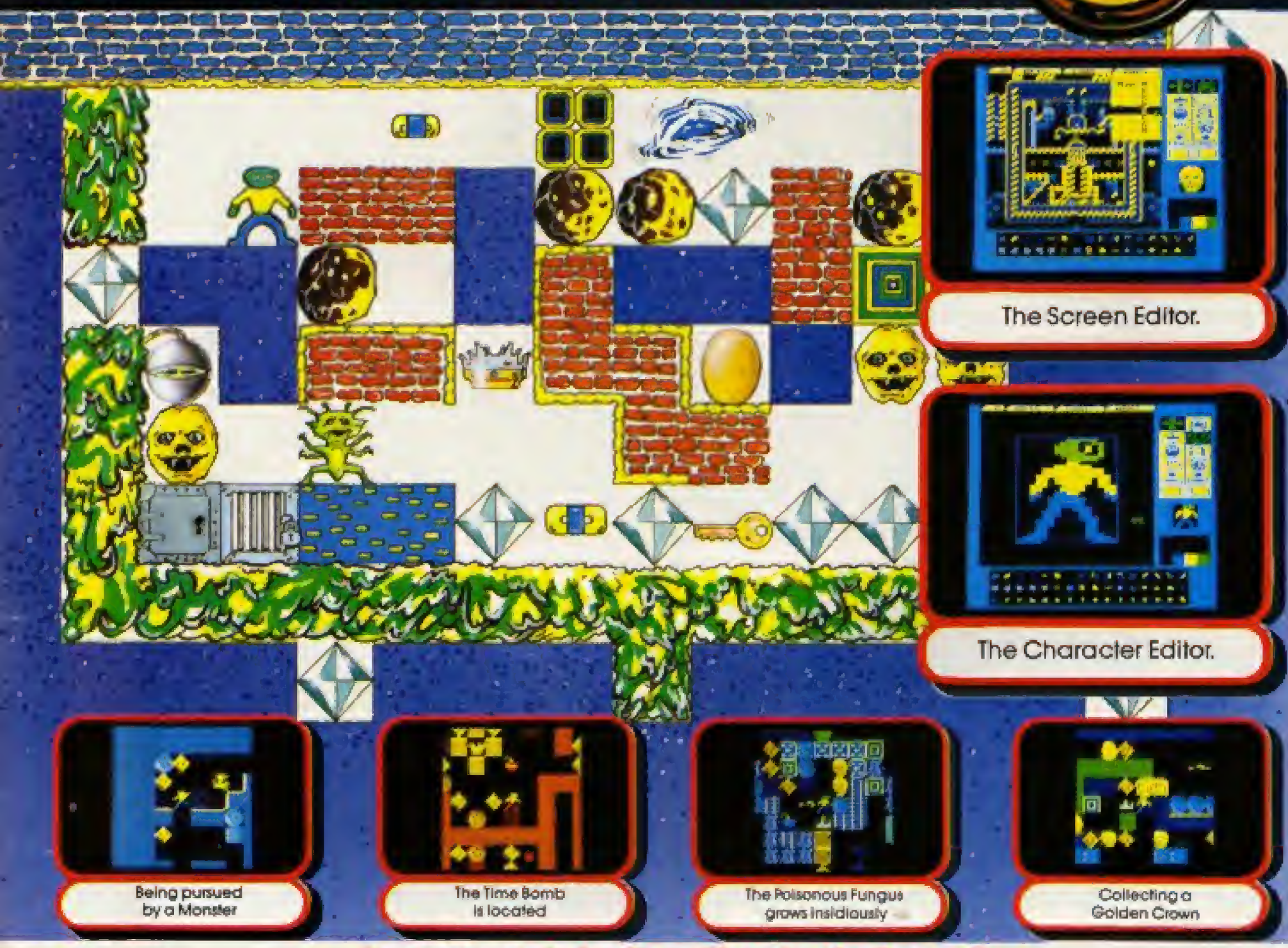
For the COMMODORE, AMSTRAD, BBC MICRO, ELECTRON

REPTON 3

THE ULTIMATE CHALLENGE



The Screen Editor.

The Character Editor.

Being pursued by a Monster

The Time Bomb is located

The Poisonous Fungus grows insidiously

Collecting a Golden Crown

Are you ready for the ultimate challenge?

Our original Repton game was immediately acclaimed as a refreshingly new concept: a game requiring dexterity to complete its arcade-style elements, and clear logical thinking to solve its strategic puzzles. Repton involves retrieving treasure from cleverly-constructed traps of falling rocks whilst avoiding the fearsome monsters and haunting spirits. "This is an astounding game reaching new heights in BBC arcade adventures," enthused the Micro User magazine.

Last Christmas saw the release of Repton 2, larger and much more challenging than before. Acorn User's Technical Editor Bruce Smith wrote: "Repton 2 is better than anything I've played on the BBC Micro or Electron. Brilliant!"

Now, completely rewritten and improved for the Commodore, Amstrad, BBC Micro and Electron, we proudly present Repton 3. For the first time, a screen-designer is included: try to devise screens that will perplex your friends, then see if you can solve their newly-designed screens. Another innovation is the character-designer which enables you to design your own monsters, rocks, eggs, spirits, diamonds . . . any or all of the game's characters can be redefined as you wish.

Repton 3 is much larger than its predecessors — it has 24 fascinating screens, and players who are skilful enough to complete them all can enter our prize competition described below. All the favourite Repton characters have been retained, together with several new features: a creeping poisonous fungus which grows at an alarming rate; time bombs and time capsules (for puzzles in the 4th dimension); and golden crowns as well-deserved rewards for your endeavours. **Can YOU complete Repton 3?**

PRIZE COMPETITION

If you complete Repton 3, you can enter our competition. Prizes include over £200 in cash, with T-shirts, mugs, badges and pens for runners-up.

COMMODORE 64/128 • AMSTRAD CPC 464/664/6128
BBC MICROS: B, B+, MASTER, MASTER COMPACT • ELECTRON

Commodore Cassette	£9.95	BBC Micro Cassette	£9.95
Commodore Disc	£11.95	BBC Micro Disc	£11.95
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SUPERIOR SOFTWARE Limited

ACORNSOFT

The screen pictures above show the BBC Micro version of Repton 3.

Dept. R9, Regent House, Skinner Lane, Leeds LS7 1AX. Telephone: 0532 459453.

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The Superior Collection
Volume 3

For the Acorn Electron

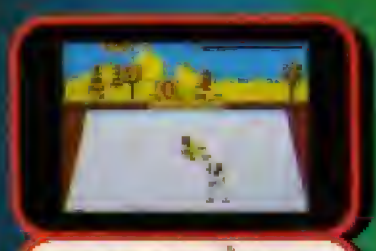
NEW RELEASE

SYNCRON

REPTON

Voted COMPUTER GAMER'S BBC MICRO GAME OF THE YEAR 1985

REPTON 2

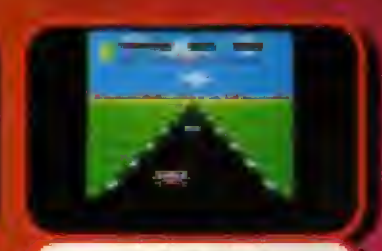


KARATE COMBAT

DEATHSTAR

MR. WIZ

SMASH AND GRAB



OVERDRIVE

A New Concept in Compilations

The Superior Collection Volume 3 features one brand new game, Syncron, together with 7 of Superior Software's classic hits for the Acorn Electron.

Syncron is a fast-action game set against a backdrop of an enormous graphically-detailed scrolling landscape.
The landscape is, in total, 1024 times the size of the screen. You must endeavour to complete 16 hair-raising missions; in each mission you have to collect a number of power cylinders, land your spacecraft on a runway with each cylinder in turn, and finally locate and bomb the HQ Building. Whilst skilfully manoeuvring your spacecraft between the defence pylons and force-fields, you are attacked by alien spacecraft and missiles launched from the land bases.
A superb game, worth at least £7.95 in its own right.

Acorn Electron dual cassette	£9.95
Acorn Electron 3½" disc	£14.95

Here's what the computer press said about some of the other titles on this compilation package:—

REPTON: "This is an astounding game reaching new heights in Electron arcade adventures." . . . ELECTRON USER

REPTON 2: "Repton 2 is better than anything I've played on the BBC Micro or Electron. Brilliant!" . . . ACORN USER

DEATHSTAR: "Deathstar is a super fast, all action arcade classic. It's the sort of game that you can't put down . . . The graphics are excellent and the scrolling is very smooth in all four directions. The pace is fast and furious even on the starting screen. This action packed game is recommended for all arcade gamers."
. . . ELECTRON USER

SMASH AND GRAB: "As usual with Superior products the graphics are excellent, with a good use of colour and no flicker. I expect this game will have you rolling with laughter. I certainly did.

Instructions	95%	
Playability	95%	Awarded
Graphics	100%	★★★★★
Value For Money	100%	(Top Rating)"

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